

Research Report 1244

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# THE FIFTH TANK CREWMAN SURVEY: THE IMPACT OF ADDITIONAL TANK CREWMEN ON REPORTED PERFORMANCE IN ARMOR UNITS

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Eugene H. Drucker  
Human Resources Research Organization  
and  
Newell K. Eaton  
Army Research Institute



ARI FIELD UNIT AT FORT KNOX, KENTUCKY



U. S. Army

Research Institute for the Behavioral and Social Sciences

April 1980

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The assignment of additional tank crewmen to the armor battalions resulted in reported improvements in quality of training, capability to perform adequately during a 72-hour sustained operation, unit readiness, and adequacy of support. Unit augmentation also resulted in reports of reduced turbulence. Partial improvements were reported in morale and quality of maintenance. The assignment of additional crewmen did not adversely affect the reported capability of battalions to perform administrative actions, adequacy of transportation, or seriousness of command and control problems. The assignment of the additional crewmen directly to platoons was the most preferred alternative organization, while the assignment of the additional crewmen to battalion headquarters was the least preferred.

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**Research Report 1244**

**THE FIFTH TANK CREWMAN SURVEY:  
THE IMPACT OF ADDITIONAL TANK CREWMEN ON  
REPORTED PERFORMANCE IN ARMOR UNITS**

Eugene H. Drucker  
Human Resources Research Organization

and

Newell K. Eaton  
Army Research Institute

Submitted by:  
Donald F. Haggard, Chief  
ARI FIELD UNIT AT FORT KNOX, KENTUCKY

Approved by:  
E. Ralph Dusek, Director  
PERSONNEL AND TRAINING  
RESEARCH LABORATORY

U.S. ARMY RESEARCH INSTITUTE FOR THE BEHAVIORAL AND SOCIAL SCIENCES  
5001 Eisenhower Avenue, Alexandria, Virginia 22333

Office, Deputy Chief of Staff for Personnel  
Department of the Army

April 1980

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Army Project Number  
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Tank Crew Performance

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**FOREWORD**

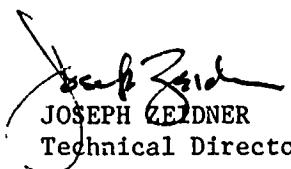
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A full tank crew of four men is needed to operate an Army tank successfully and to maintain it properly. For a variety of legitimate reasons, armor units are currently seldom fully manned and in the case of war could not replace men lost in combat. Therefore, in 1977 the Army Tank Forces Management Group recommended investigating the assignment of a fifth crewman for each tank.

In response to these recommendations, the Department of the Army ordered a test to be conducted of the augmented tank crew or "fifth crewman" concept. The Training and Doctrine Command (TRADOC) was tasked to be test manager, and the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) assigned to assist. TRADOC tasked the U.S. Army Armor Center (USAARMC) as the test proponent and the U.S. Army Combat Developments Experimentation Command (USACDEC) as the test organization. USACDEC was responsible for collecting objective test data. The ARI Field Unit at Fort Knox was responsible for collecting subjective data under Army Project 2Q762722A764. The Human Resources Research Organization (HumRRO), under Contract DAHCl9-76-C-0001 with ARI, provided further assistance in collecting subjective data.

This report describes the positive effects on unit performance of adding a fifth tank crewmember, as well as the preferred methods of assigning additional crewmen.

CPT Donald S. Weir prepared the Independent Evaluation Plan for the Directorate of Combat Developments and provided invaluable aid in conceptualizing the research and in developing research strategies and materials.



JOSEPH ZELDNER  
Technical Director

THE FIFTH TANK CREWMAN SURVEY: THE IMPACT OF ADDITIONAL TANK CREWMEN ON REPORTED PERFORMANCE IN ARMOR UNITS

BRIEF

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Purpose:

The purpose of this research was to examine the impact of additional tank crewmen on reported performance in armor units, and to determine the degree of preference for alternate methods of organizing the additional crewmen.

Procedure:

Questionnaires and interviews were administered to battalion commanders and subordinate leaders in twelve armor battalions in USAREUR, each augmented in strength with the assignment of 54 additional tank crewmen, and in six battalions that were not augmented in strength. Performance ratings obtained from the two types of battalions were compared statistically to determine the effects of augmentation on reported performance. In addition, comparisons were made of the acceptability of five alternative methods for organizing and assigning the additional crewmen to units.

Results:

Assignment of additional tank crewmen to the armor battalions resulted in reported improvements in quality of training, capability to perform adequately during a 72-hour sustained operation, unit readiness, and adequacy of support. Unit augmentation also resulted in reports of reduced turbulence. Partial improvements were reported in morale and quality of maintenance. The assignment of the additional crewmen did not adversely affect the reported capability of battalions to perform administrative actions, adequacy of transportation resources, or seriousness of command and control problems. The assignment of the additional crewmen directly to platoons was the most preferred alternative organization, while the assignment of the additional crewmen to battalion headquarters was the least preferred.

These results were discussed in light of the possible biases that operate in research involving subjective data.

Use of Findings:

Test results should be of interest to DA level planners, to managers within the Armor community and to others responsible for the readiness, organization, and personnel strength of armor units.

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THE FIFTH TANK CREWMAN SURVEY:  
THE IMPACT OF ADDITIONAL TANK CREWMEN  
ON REPORTED PERFORMANCE IN ARMOR UNITS

INTRODUCTION

The Table of Organization and Equipment (TOE) for armor units specifies that the seventeen tanks in a tank company be manned with a complement of 68 crewmen. While the assignment of these crewmen to tank companies would supposedly enable each unit to fully man its tanks, the seventeen tanks are rarely fully manned. This is due in part to absences resulting from leave, sick call, in-processing, out-processing, and assignment to details. In part it is due to the assignment of tank crewmen to Special Duty, and in some cases to the failure to assign the full complement of 68 men to a tank company.

The successful operation of a tank requires the coordination of the full four-man crew. Many duties performed during training involve close interaction between the crewmen in all four positions. These duties cannot be taught or practiced in the absence of one or more members of the crew. During certain training exercises, therefore, armor commanders supplement their crews by resorting to battle rosters, the temporary assignment of non-armor personnel to crews. Not only can this practice result in less efficient crew performance, it can also interfere with the normal operation of the unit since the non-armor personnel would not be available to perform their normal duties.

The shortage of armor crewmen can also interfere with tank maintenance. Routine maintenance is frequently delayed because there are not enough men available to complete the required number of maintenance tasks. The performance of quarterly services also suffers because there are not enough men to assist the vehicle mechanics.

In order to attain full crews, armor commanders often shift personnel from one crew to another or from one position within a crew to another. The turbulence created by these shifts in personnel has been reported to degrade unit performance since the men within a crew would not be accustomed to working with each other, at their new duty position, or, in some cases, with the particular vehicle to which they may be assigned. In addition, it is generally assumed that turbulence lowers morale, which, in turn, causes further degradation of performance.

In 1977, the Tank Forces Management Group issued a report dealing with the shortage of authorized tank crewmen in armor units.<sup>1</sup> The report states that the loss in the effectiveness of a Tank Weapon System resulting from the absence of just one crewman is greater than 50 percent.

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<sup>1</sup>Kalergis, J.G. Tank Forces Management Group Study Report, Fort Knox, Kentucky: Office of Armor Force Management (OAFM), April, 1977.

The report also notes that the full complement of four crewmen does not provide for replacements of crewmen lost in combat, and that it does not provide sufficient manpower for the efficient operation or servicing of the equipment.

The Tank Forces Management Group indicated in their report that new equipment will enable vehicles to operate round-the-clock. Present personnel shortages, however, would not only interfere with the normal operations of these vehicles, they would make it difficult to exploit the new technological advances. Consequently, the recommendation was made that the number of crewmen in armor units be increased by one crewman per tank. A further recommendation was made that the effects of this increase be assessed in an analysis of the manpower requirements needed to operate equipment in tank units, and that alternative methods of assigning the additional crewmen be examined.

In response to these recommendations, the Department of the Army (DA) ordered that a test be conducted of the augmented tank crew or "fifth crewman" concept. The Training and Doctrine Command (TRADOC) was tasked to serve as the test manager for the "Fifth Tank Crewman" test, and the U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) was assigned the responsibility of assisting the test organization. TRADOC tasked the U.S. Army Armor Center (USAARMC) to serve as the test proponent and the U.S. Army Combat Developments Experimentation Command (USACDEC) to be the test organization. Subsequently, it was agreed that USACDEC would be responsible for the portion of the test dealing with objective data, while ARI would be responsible for that portion dealing with subjective data. The Human Resources Research Organization (HumRRO), under contract with ARI, provided further assistance in the portion of the test dealing with subjective data.

An Independent Evaluation Plan developed by the Directorate of Combat Developments (DCD) for the U.S. Army Armor Center listed five test objectives. These were:

1. To assess the manpower required to ensure tanks are fully manned to meet operational, training, and maintenance requirements.
2. To assess unit readiness for combat as a result of the assignment of a fifth tank crewman.
3. To assess the different prescribed methods of utilizing the additional crewman.
4. To survey the impact on logistics and administrative requirements as a result of the assignment of a fifth tank crewman.
5. To assess the impact on command and control as a result of the assignment of a fifth tank crewman.

A Fifth Tank Crewman Test Survey Design Plan, prepared by USACDEC with assistance from ARI, contained specific issues related to each of the five test objectives. The Survey Design Plan also contained brief descriptions of the types of data that would be required in order to be responsive to each issue and the type of statistical comparisons that ought to be made once the data were collected. In accordance with the decision that USACDEC would be responsible for objective data while ARI would be responsible for subjective data, ARI developed and administered the data collection instruments dealing with issues requiring subjective judgments, and interpreted the results of the statistical analyses performed on these data.

#### Survey Issues

Five clusters of survey issues were generated from the Test Objectives. The first cluster dealt with the effects of the assignment of the additional tank crewmen on unit performance. The specific aspects of unit performance that were examined were:

- Maintenance
- Training
- Sustained Operations
- Unit Readiness
- Administrative Reporting
- Transportation
- Logistics
- Command and Control

The second cluster dealt with the effects of the assignment of the additional tank crewmen on the tank crewmen themselves. The specific issues dealt with:

- Morale
- "Second-String" Feelings

The third cluster dealt with opinions concerning alternate methods for organizing the additional tank crewmen and assigning them to units. The specific issues that were examined dealt with:

- Preference for Each Alternative Organization
- Preference for Additional Organizations

- Command and Control, Logistics, and Training Problems Anticipated Under Each Alternative Organization

The fourth cluster dealt with judgments of the number of additional tank crewmen in different grade/skill levels that would be needed to enable a platoon to fully man its tanks.

The final cluster dealt with crew turbulence. The specific aspects of crew turbulence that were examined were:

- Turbulence Rate
- Effects of Turbulence On Unit Performance

## METHOD

Eighteen armor battalions in USAREUR and six armor battalions in CONUS participated in the "Fifth Tank Crewman" test. Twelve of the USAREUR battalions were each augmented in strength with 54 additional tank crewmen, one crewman for each tank in an armor battalion. This level of augmentation was made possible by a Department of the Army authorization for 648 additional tank crewmen. The remaining six battalions in USAREUR were not augmented in strength, but were filled to 100 percent of strength authorized by the TOE. The six battalions in CONUS were neither augmented nor filled to 100 percent authorized strength.

The number of additional tank crewmen assigned to the test battalions and the organizational level to which they were assigned are summarized in Table 1. In six of the twelve augmented battalions in USAREUR, the additional tank crewmen were to be assigned by the battalions to company headquarters for control and administration. In the other six augmented battalions, the additional crewmen were to be assigned by the battalions to platoons. The purpose for assigning some of the additional crewmen to company headquarters and others to platoons was to compare the effects of the two levels of assignment. It was observed during the survey that most of the additional crewmen were assigned to platoons regardless of the assignment level that was intended. Consequently, any differences found between battalions augmented at company level and those augmented at platoon level can probably be attributed to chance.

Table 1

Number of Additional Crewmen Assigned to Test Battalions and Organizational Level of Assignment

Battalion Location	Filled to Authorized Strength	Number of Additional Tank Crewmen Per Battalion	Organizational Level of Assignment	Number of Battalions
USAREUR	Yes	54	Company	6
USAREUR	Yes	54	Platoon	6
USAREUR	Yes	0	N/A	6
CONUS	No	0	N/A	6

The six nonaugmented battalions in USAREUR were baseline or control battalions that were compared with the augmented battalions in order to assess the effects of augmentation. The six nonaugmented battalions in CONUS were baseline or control units that were compared with the non-augmented battalions in USAREUR to determine the degree of similarity that existed between nonaugmented battalions in the two different locations. It was assumed that any of the effects of augmentation that occurred in USAREUR would also occur upon augmentation in CONUS, and that the magnitude of these effects would be similar provided that no differences were found between the nonaugmented battalions in these two locations.

#### Procedure

To determine the impact of the additional tank crewmen on unit performance and to assess opinions regarding alternate methods for organizing these additional crewmen, questionnaire and interview items were prepared pertaining to the various issues. Questionnaires and interviews containing these items were administered to battalion commanders and representative samples of subordinate leaders. Questionnaires were also administered to samples of tank crewmen, including the additional crewmen who were called "assistant crewmen."

The data were collected during two different data collection periods in order to assess the effects of augmentation over time. The additional tank crewmen were to be assigned to augmented units by December, 1978, and the first data collection phase occurred during the months of January, February, and March, 1979. The second data collection phase occurred during the months of April, May, and June, 1979. The survey instruments were administered in garrison while the units were involved in home station operations and training.

To assess the similarity between nonaugmented units in CONUS and those in USAREUR, questionnaires were also administered in CONUS to battalion commanders and representative samples of subordinate leaders. The data were again collected at two different periods of time. The first data collection phase in CONUS occurred during the months of March and April, 1979, while the second data collection phase occurred during the months of June and July, 1979.

#### Respondents

Within USAREUR, all battalion commanders, company commanders, first sergeants, battalion S1s, battalion S4s, and battalion maintenance officers assigned to the 18 test battalions participated in the survey; the other participants included samples of platoon leaders, platoon sergeants, and tank crewmen from these battalions. Within CONUS, all battalion commanders, company commanders, and battalion maintenance officers assigned to the six test battalions participated in the survey; the other participants included samples of platoon leaders and platoon sergeants from these battalions. A total of 540 respondents participated in USAREUR during the first data phase, while 519 respondents

participated during the second phase. A total of 65 respondents participated in CONUS during the first phase, while 66 respondents participated during the second phase. The number of respondents who participated in each data collection phase is presented in Table 2 for each type of battalion by position of respondent.

Table 2

Number of Respondents in Each Position by Battalion Type  
and Data Collection Phase

Position of Respondent	Battalion Type							
	Augmented Company Level-USAREUR		Augmented Platoon Level-USAREUR		Nonaugmented USAREUR		Nonaugmented CONUS	
	First Phase	Second Phase	First Phase	Second Phase	First Phase	Second Phase	First Phase	Second Phase
Battalion Commander	6	6	6	6	6	6	6	6
Company Commander	18	18	18	17	18	17	18	18
Platoon Leader	18	18	18	18	18	17	18	18
Platoon Sergeant	18	18	18	18	18	18	17	18
First Sergeant	18	18	18	17	18	17		
S1	6	6	6	6	6	6		
S4	6	6	6	6	6	6		
Maintenance Officer	6	5	6	6	6	6	6	6
Tank Commander	18	18	18	18	18	18		
Gunner	18	18	18	17	18	18		
Driver	18	18	18	17	18	18		
Loader	18	18	18	17	18	18		
Assistant Crewman	18	14	18	10				
Total	186	181	186	173	168	165	65	66

The sampling of respondents was as follows. In all battalions, one platoon leader and one platoon sergeant were selected from each company with the restriction that they not be from the same platoon. In addition, within USAREUR, one tank commander, one gunner, one driver, and one loader were selected from each company with the restriction that at least one person be selected from each platoon, but that no two crewmen be from the same tank. In the augmented battalions, the sample also included one of the additional tank crewmen from each company with the restriction that this assistant crewman not be assigned to a tank to which one of the other participating crewmen was assigned.

To be eligible for participation in the survey, it was required that each respondent either occupy his position for at least one month, or if he occupied the position for less than one month, that he be judged qualified to answer the questions as a consequence of previous experience within the unit.

The participants in the sampled positions were chosen randomly prior to the conduct of the survey. When the chosen respondent was not available for participation, substitutes were designated; the substitutes were also selected randomly within the same restrictions applied to the basic sample.

#### Questionnaires

Separate questionnaires were prepared for respondents in each position. The questionnaires for a given position contained questions pertinent only to persons in that position. The questionnaires consisted primarily of multiple choice questions, although there were some that required the respondents to rank order a set of alternatives or to write in a numerical value. The items prepared for respondents in different positions were written in terms of the unit level to which the respondent was assigned. Thus, questions prepared for battalion commanders were oriented toward the battalion, those prepared for company commanders were oriented toward the company, and so forth. When the same question appeared in different questionnaires, it differed only in the level of unit designation.<sup>1</sup>

Since Objective 2 was the only test objective which contained issues for which subjective data were required from battalions in CONUS, only items pertaining to this objective were included in questionnaires prepared for administration in CONUS.

None of the questionnaire items pertained directly to the effects of the additional tank crewmen. Each question was designed primarily to assess the perceived quality of unit performance within the unit to which the respondent was assigned. The impact upon unit performance of the assignment of additional crewmen to battalions was assessed by comparing the responses obtained from the two types of augmented battalions with those obtained from the nonaugmented battalions in USAREUR. Likewise, the

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<sup>1</sup>The questions contained in the questionnaires are paraphrased in the Results section of this report. The exact questions are presented in USACDEC Report CDEC-TR-79-003, Fifth Tank Crewman Survey, Volume II (Test Data).

similarity between nonaugmented battalions in CONUS and those in USAREUR was assessed by comparing the responses obtained from battalions in CONUS with those obtained from the nonaugmented USAREUR battalions.

The questionnaires contained two types of questions--primary and secondary. Primary questions were written in general terms to obtain an overall assessment pertaining to an issue, while secondary questions were written in specific terms to provide more detailed information. Responses to primary questions, which comprised the basic data of the research, were analyzed statistically. Responses to secondary questions were summarized and used as necessary to provide interpretive detail on results from primary questions.

Items were scored by assigning numerical values to each response alternative or ranking. In all cases, high values are favorable and low values are unfavorable. The most unfavorable response was always assigned a value of 1.0; the most favorable response was always assigned a value equal to the number of response alternatives associated with the item.

#### Interviews

Separate interviews were prepared for the respondents in different positions. The questions in each interview were written in terms of the unit level to which the respondent was assigned. Many questions pertained directly to the effects of the additional tank crewmen, and consequently these items were not administered in the nonaugmented battalions. The purpose of these questions was to help explain any differences found between augmented and nonaugmented battalions on the primary questionnaire items.<sup>1</sup>

#### Administration of Questionnaires and Interviews

The questionnaires were administered in group situations during the garrison visits. No time limits were imposed. The interviews, which were conducted only in USAREUR, were administered during the visits by two retired Army officers. A respondent was interviewed only after he had completed the questionnaire. The questionnaire responses made by a respondent were available to the interviewers during the conduct of the interview.

#### Pilot Test

A pilot test was conducted during December 1978 to evaluate the administrative procedures and to assess the clarity of the questionnaire and interview items. One augmented battalion and one nonaugmented

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<sup>1</sup>The questions contained in the interviews are paraphrased in the Results section of the report. The exact questions are in USACDEC Report CDEC-TR-79-003, Fifth Tank Crewman Survey, Volume II (Test Data).

USAREUR battalion were visited during the pilot test. Items that were found to be unclear were rewritten prior to the conduct of the actual survey.

#### Correction for Prior Participation

Data were collected twice in both USAREUR and CONUS. It was intended that the same respondents participate during both data collection phases. However, of the 585 respondents who participated during the second data collection phase, 319 were found not to have participated during the first data collection phase. A breakdown of the 319 new respondents is presented in Table 3 for each type of battalion by position of respondent.

Since it was possible that participation in the first data collection phase could affect responses made during the second phase, the effects of prior participation were removed. Corrections were made in the second-phase scores whenever significant differences were found between "old" respondents (those who participated in both phases) and "new" respondents (those who did not participate in the first phase) on a primary item. Since the secondary items were not analyzed statistically, corrections were not made on the secondary items.

To determine whether participation influenced second phase responses, the responses made by "old" and "new" respondents were compared on each primary item using analysis of variance. Whenever the responses made by the respondents in the two groups were found to differ significantly (i.e., at or beyond the .05 level of significance), a correction was made to remove the difference. The correction was accomplished by adding or subtracting to the score for each "new" respondent an amount equal to the difference between the means for the two groups on that particular item. If the mean for "old" respondents was greater than the mean for "new" respondents, the difference was added to the score for each "new" respondent; if the mean for "old" respondents was less than the mean for the "new," the difference was subtracted from the score for each new respondent. The two groups were not adjusted for possible differences in variance.

#### Analyses

Comparisons between augmented and nonaugmented USAREUR battalions were made using fixed-model analyses of variance with Battalion Type, Position of Respondent, and Data Collection Phase as factors. Whenever a significant main effect was obtained for Battalion Type, a contrast was made between augmented and nonaugmented battalions. In addition to the examination of main effects, the interactions between Battalion Type and the other two factors were examined. Whenever a significant interaction occurred between Battalion Type and Data Collection Phase, simple effects analyses were conducted for each data collection phase.

Comparisons between nonaugmented USAREUR battalions and CONUS battalions were made using fixed-model analyses of variance with Battalion Location, Position of Respondent, and Data Collection Phase as factors.

Table 3

Number of New Respondents in Each Position  
During the Second Data Collection Phase by Battalion Type

Position Of Respondent	Battalion Type			
	Augmented Company Level	Augmented Platoon Level	Nonaugmented USAREUR	Nonaugmented CONUS
Battalion Commander	1	2	4	2
Company Commander	1	4	8	6
Platoon Leader	12	8	8	9
Platoon Sergeant	11	11	8	9
First Sergeant	3	8	6	-
S1	3	4	1	-
S4	3	2	3	-
Maintenance Officer	2	3	3	2
Tank Commander	10	10	8	-
Gunner	14	16	15	-
Driver	9	13	14	-
Loader	14	14	14	-
Assistant Crewman	12	9	-	-
Total	95	104	92	28

In addition to the examination of main effects, the interactions between Battalion Location and the other two factors were examined. Whenever a significant interaction occurred between Battalion Location and Data Collection Phase, simple effects analyses were conducted for each data collection phase.

Other analyses conducted during the survey are described in the Results section of this report.

## RESULTS

Detailed test data, including summary statistics for all statistical tests, are contained in USACDEC Report CDEC-TR-79-003, Fifth Tank Crewman Survey, Volume II (Test Data). Means and summary statistics on the primary questions are presented in the present report primarily when significant main effects were obtained for battalion type, battalion location, or alternative organization, or when any of these factors were involved in a significant interaction. Means are presented for the secondary questions whenever a significant effect was obtained for Battalion Type or Battalion Location on the primary question. Interview responses are presented in support of questionnaire responses if made by more than 10% of the respondents.

The statistical tests of the effects of prior participation on responses made during the second data collection phase on the primary questions showed that participation had significant effects, within USAREUR, on ratings of quality of maintenance ( $F = 15.09$ ;  $df = 1,165$ ;  $p < .01$ ), quality of training ( $F = 23.30$ ;  $df = 1,153$ ;  $p < .01$ ), capability to perform adequately during a 72-hour sustained operation ( $F = 22.55$ ;  $df = 1,153$ ;  $p < .01$ ), state of unit readiness ( $F = 17.82$ ;  $df = 1,153$ ;  $p < .01$ ), and seriousness of command and control problems ( $F = 4.80$ ;  $df = 1,52$ ;  $p < .05$ ). In all cases, the mean response for the respondents who had participated earlier was greater than the mean response for new respondents. The following amounts were therefore added to the values of the responses made by each new respondent:

- Maintenance: 0.6
- Training: 0.9
- Sustained Operations: 0.8
- Unit Readiness: 0.8
- Command and Control: 0.3

No effects of prior participation on responses made during the second data collection phase were obtained in comparisons between non-augmented units in USAREUR and those in CONUS.

### Effects of the Assignment of Additional Tank Crewmen on Unit Performance

#### Maintenance

Primary Questionnaire Item. Battalion commanders, company commanders, platoon leaders, platoon sergeants, and maintenance officers in both USAREUR and CONUS were asked to describe the overall quality of the maintenance performed on tanks by the crews in their unit. A seven-point rating scale contained responses ranging from "extremely good" to "extremely bad."

• USAREUR. The mean corrected ratings of the overall quality of maintenance were 5.83 in battalions augmented at company level, 5.77 in battalions augmented at platoon level, and 5.40 in nonaugmented battalions. These means show that the quality of overall maintenance was described to be better in augmented than in nonaugmented battalions.

The analysis of variance resulted in a significant main effect for Battalion Type ( $F = 5.15$ ;  $df = 2,179$ ;  $p < .01$ ) and a significant interaction between Battalion Type and Data Collection Phase ( $F = 5.41$ ;  $df = 2,179$ ;  $p < .01$ ). None of the other interaction involving Battalion Type were statistically significant.

The mean ratings for each battalion type are shown in Table 4 by data collection phase.

Table 4  
Mean Maintenance Ratings By Battalion Type and Data Collection Phase

Data Collection Phase	Battalion Type		
	Augmented Company Level	Augmented Platoon Level	Nonaugmented
First	5.82	5.46	5.36
Second	5.85	6.08	5.44

As a result of the interaction between Battalion Type and Data Collection Phase, separate simple effects were conducted for each data collection phase. During the first data collection phase, the simple effect for Battalion Type was not significant. During the second data collection phase, a significant simple effect was obtained for Battalion Type ( $F = 4.87$ ;  $df = 2,179$ ;  $p < .01$ ). A contrast between augmented and non-augmented battalions showed that overall quality of maintenance was rated significantly higher in augmented than in nonaugmented battalions ( $F = 8.50$ ;  $df = 1,179$ ;  $p < .01$ ).

The significant interaction between Battalion Type and Data Collection Phase appears to reflect the relatively higher ratings of the overall quality of maintenance during Phase 2 than during Phase 1 in battalions augmented at platoon level. During the first data collection phase, the quality of maintenance in battalions augmented at platoon level, although described as better than the quality of maintenance in nonaugmented battalions, was not rated as high as it was in battalions augmented at company level. During the second data collection phase, ratings of the quality of maintenance showed little change in battalions augmented at company level and in nonaugmented battalions. However, the ratings increased in battalions augmented at platoon level and were higher than the ratings in battalions augmented at company level.

. CONUS. The mean ratings of the overall quality of maintenance were 5.25 in nonaugmented USAREUR battalions and 4.82 in CONUS battalions. The analysis of variance resulted in a significant main effect for Battalion Location ( $F = 5.21$ ;  $df = 1,120$ ;  $p < .05$ ). None of the interactions involving battalion location were statistically significant.

Secondary Questionnaire Items. The respondents answered four secondary questions pertaining to maintenance. One question asked respondents to describe the quality of day-to-day crew maintenance performed on tanks by crews in their units, while another asked them to describe the quality of quarterly services. These two questions were followed by seven-point rating scales with responses ranging from "extremely good" to "extremely bad." The two remaining questions asked the respondents to describe the adequacy of the number of tank crewmen that were available in their units for performing day-to-day crew maintenance on tanks and assisting in the performance of quarterly services on tanks. These questions were followed by seven-point rating scales with responses ranging from "extremely adequate" to "extremely inadequate."

. USAREUR. The mean ratings for each of the secondary questions are summarized in Table 5 by battalion type for each data collection phase.

The responses made on the secondary items during both data collection phases indicate that there were only small differences between the augmented and nonaugmented battalions in the perceived quality of crew maintenance and quarterly services, but that the perceived adequacy of the number of men available to perform day-to-day crew maintenance and to assist in the performance of quarterly services was considerably higher in augmented battalions than in nonaugmented battalions.

. CONUS. The mean ratings for each of the secondary questions are summarized in Table 6 by battalion location.

The responses made on the secondary questions indicate that the quality of both day-to-day crew maintenance and quarterly services was perceived to be slightly higher in nonaugmented USAREUR battalions than in CONUS battalions. In addition, the number of men who were available to perform or assist in the performance of these two types of maintenance was perceived to be more adequate in nonaugmented USAREUR battalions than in CONUS battalions.

Interview Questions. The interview contained four questions pertaining to the effects of the additional tank crewmen on maintenance. These questions asked the respondents to describe the specific ways in which the assignment of the additional tank crewmen (1) improved the ability of crews in their unit to perform day-to-day crew maintenance, (2) hindered the ability of the crews to perform day-to-day crew maintenance, (3) improved the ability of the crews to assist in the performance of quarterly services, and (4) hindered their ability to assist in the performance of quarterly services. A total of 132 persons responded during the first data collection phase to interview questions pertaining to maintenance, while 130 persons responded during the second data collection phase.

Table 5

Mean Maintenance Ratings on Secondary Questions  
by Battalion Type and Data Collection Phase

Secondary Question	Data Collection Phase	Battalion Type		
		Augmented Company Level	Augmented Platoon Level	Non-augmented
Quality of Day-to-Day Crew Maintenance	First	5.53	5.48	5.19
	Second	5.52	5.67	5.08
Quality of Quarterly Services	First	5.36	5.36	4.92
	Second	5.45	5.42	4.98
Adequacy of Number of Crewmen to Perform Day-to-Day Crew Maintenance	First	5.29	5.24	3.43
	Second	4.97	4.98	3.22
Adequacy of Number of Crewmen to Assist in Quarterly Services	First	5.69	5.63	3.86
	Second	5.41	5.44	4.11

Table 6

Mean Maintenance Ratings on Secondary Questions  
by Battalion Location

Secondary Question	Battalion Location	
	USAREUR	CONUS
Quality of Day-to-Day Crew Maintenance	5.13	4.71
Quality of Quarterly Services	4.95	4.57
Adequacy of Number of Crewmen to Perform Day-to-Day Crew Maintenance	3.33	2.64
Adequacy of Number of Crewmen to Assist in Quarterly Services	3.99	3.22

. Improvement in Day-to-Day Crew Maintenance. Within the augmented battalions, the most frequently given reasons for an improvement in the ability to perform day-to-day crew maintenance were that the additional crewmen provide the personnel strength to fill crew positions that were lost due to extra duties (N = 97,74)<sup>1</sup>; there is a sufficient number of people available to perform maintenance (N = 93,109); the additional crewmen provide sufficient personnel to perform heavy tasks, such as changing tracks (N = 76,14); there is greater stabilization of crewmembers (N = 29,50); and there is less chance of maintenance not being performed with the additional crewmen (N = 22,28).

. Hindrances in Day-to-Day Crew Maintenance. No hindrances were reported by the required number of respondents.

. Improvement in Quarterly Services. The most frequently given reasons for an improvement in the ability to perform quarterly services were that the additional crewmen provide more labor (N = 95,83); the additional crewmen enable quarterly services to be performed in less time (N = 93,45); they compensate for the absences of other crewmembers (N = 66,41); they enable quarterly services to be performed faster and more thoroughly (N = 43,33); and they enable maintenance to be performed when needed rather than when people are available to perform quarterly services (N = 43,43).

. Hindrances in Quarterly Services. Hindrances in quarterly services were not reported by enough respondents to be described.

Findings. The effects of augmentation on maintenance indicated better maintenance in augmented battalions than in nonaugmented battalions during the second data collection phase, but not during the first. While ratings of the quality of maintenance were relatively constant in battalions augmented at company level and in nonaugmented battalions, they increased from the first data collection phase to the second phase in battalions augmented at platoon level.

Major differences appeared on the secondary items. The number of men who were available for day-to-day crew maintenance, and for assisting in the performance of quarterly services, was seen as more adequate in the augmented battalions than in the nonaugmented battalions.

The major benefit of the additional tank crewmen was reported to be the availability of the extra people for performing maintenance tasks. Few hindrances were reported as a result of the additional crewmen.

Maintenance was described to be better among the nonaugmented battalions in USAREUR than in CONUS. Responses on the secondary items indicated that this difference reflected the greater number of men available in USAREUR for performing day-to-day crew maintenance and assisting in the performance of quarterly services.

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<sup>1</sup>The first figure within each parentheses indicates the number of respondents who made the response during the first data collection phase; the second figure indicates the number who made the response during the second data collection phase.

## Training

Primary Questionnaire Item. Battalion commanders, company commanders, platoon leaders, and platoon sergeants in both USAREUR and CONUS were asked to describe the overall quality of training received by the tank crewmen in their unit. A seven-point rating scale contained responses ranging from "extremely good" to "extremely bad."

USAREUR. The mean corrected ratings of the overall quality of training were 5.75 in battalions augmented at company level, 5.88 in battalions augmented at platoon level, and 5.21 in nonaugmented battalions. The analysis of variance resulted in a significant main effect for Battalion Type ( $F = 10.92$ ;  $df = 2,165$ ;  $p < .01$ ). The interactions between Battalion Type and the other factors were not significant. A contrast between augmented and nonaugmented battalions showed that the overall quality of training was rated significantly higher in augmented than in nonaugmented battalions ( $F = 21.25$ ;  $df = 1,165$ ;  $p < .01$ ).

CONUS. The analysis of variance showed that neither the main effect for Battalion Location nor the interactions involving Battalion Location were statistically significant.

Secondary Questionnaire Items. The respondents answered five secondary questions pertaining to training. These questions pertained to the quality of individual, crew, platoon, company, and maintenance training received by the men in their unit. Each question was followed by a seven-point rating scale with responses ranging from "extremely good" to "extremely bad."

USAREUR. The mean ratings for each of the secondary questions are summarized in Table 7 by battalion type.

The responses made on the secondary items indicate that the quality of the different types of training was perceived to be higher in augmented battalions than in nonaugmented battalions.

CONUS. Since no difference was found between the nonaugmented battalions in USAREUR and CONUS battalions on the primary question, the responses made on the secondary questions were not compared.

Interview Questions. The interview contained two questions dealing with the effects of the fifth tank crewmen on training. One question asked the respondent to describe the ways in which the assignment of additional tank crewmen improved training within his unit, while the other asked him to describe the problems that have occurred as a result of the additional tank crewmen. The interviewers were further instructed to probe during the interview to obtain descriptions of the effects of augmentation on individual, crew, platoon, company, battalion, and maintenance training. A total of 120 persons responded to these questions during the first data collection phase in USAREUR, while 119 persons responded during the second phase.

Table 7

Mean Training Ratings on Secondary Questions  
by Battalion Type

Secondary Question	Battalion Type		
	Augmented Company Level	Augmented Platoon Level	Nonaugmented
Quality of Individual Training	5.59	5.61	4.87
Quality of Crew Training	5.61	5.67	5.07
Quality of Platoon Training	5.48	5.53	4.58
Quality of Company Training	5.40	5.42	4.54
Quality of Maintenance Training	5.17	5.32	4.28

Training Improvements. The reason given for an improvement in individual training was that better training occurs when there are more people available for training (N = 51,25). The reasons given for an improvement in crew training were that crew coordination is achieved with full crews (N = 94,68) and crew stability is increased with full crews (N = 91,82). The reasons given for an improvement in platoon training were that full crews result in crew stability (N = 41,81); there is an increased capability to train at times other than during an ARTEP (N = 41,59); personnel are provided to act as aggressors or as a security force (N = 28,19); and all tanks can be manned (N = 22,40). No explanations for improvements in company, battalion, or maintenance training were given by the required number of respondents.

Training Problems. Fewer than 10% of the respondents reported problems pertaining to individual, crew, platoon, company, battalion, or maintenance training during the two data collection phases.

Findings. Overall quality of training in USAREUR was described as being good in all three types of battalions, but it was significantly higher in the augmented than in the nonaugmented battalions. Responses on the secondary questions indicated that these differences occurred in ratings of the quality of individual, crew, platoon, company, and maintenance training. The improvement in individual training was attributed primarily to the increase in class size, while the improvement in crew and platoon training was attributed primarily to

increased crew stability. Other reasons were also cited to various degrees. No difference was found in the description of the quality of training between nonaugmented battalions in USAREUR and those in CONUS.

#### Sustained Operations

Primary Questionnaire Item. Battalion commanders, company commanders, platoon leaders and platoon sergeants in both USAREUR and CONUS were asked to describe the capability of their unit to perform adequately during a 72-hour sustained operation. A seven-point rating scale contained responses ranging from "extremely capable" to "extremely incapable."

. USAREUR. The mean corrected ratings of the capability to perform adequately during a 72-hour sustained operation were 6.25 in battalions augmented at company level, 6.33 in battalions augmented at platoon level, and 6.00 in nonaugmented battalions. The main effect for Battalion Type was of borderline significance ( $F = 3.02$ ;  $df = 2,165$ ;  $p = .051$ ). The interactions between Battalion Type and the other factors were not statistically significant. A contrast between augmented and nonaugmented battalions showed that augmented battalions were rated significantly more able to perform adequately during a 72-hour sustained operation than nonaugmented battalions ( $F = 5.52$ ;  $df = 1,165$ ;  $p < .05$ ).

. CONUS. The mean ratings of the capability to perform adequately during a 72-hour sustained operation were 5.79 in nonaugmented USAREUR battalions and 5.28 in CONUS battalions. The analysis of variance resulted in a significant main effect for Battalion Location ( $F = 6.59$ ;  $df = 1,110$ ;  $p < .05$ ), and a significant interaction was obtained between Battalion Location and Data Collection Phase ( $F = 4.40$ ;  $df = 1,110$ ;  $p < .05$ ). None of the other interactions involving Battalion Location were statistically significant.

The mean ratings of the capability to perform adequately during a 72-hour sustained operation are presented in Table 8 by data collection phase.

Table 8

Mean Sustained Operations Ratings by  
Battalion Location and Data Collection Phase

Data Collection Phase	<u>Battalion Location</u>	
	USAREUR	CONUS
First	5.96	5.11
Second	5.62	5.46

Separate simple effects analyses were conducted for each data collection phase. During the first phase, a significant main effect was obtained for Battalion Location ( $F = 9.93$ ;  $df = 1,110$ ;  $p < .01$ ). During the second data collection phase, the effect for Battalion Location was not statistically significant.

Secondary Questionnaire Items. There were no secondary questionnaire items pertaining to effects of the fifth tank crewmen on sustained operations.

Interview Questions. The interview contained two questions pertaining to the effects of the fifth tank crewmen on sustained operations. The first question asked respondents to describe the ways in which the assignment of the additional tank crewmen improved the ability of their unit to perform during a 72-hour sustained operation, while the second question asked them to describe how the assignment of the additional tank crewmen hindered this ability. A total of 120 persons responded to these questions during the first data collection phase, while 119 persons responded during the second data collection phase.

. Improved Sustained Operations. The most frequently given reasons for an improved ability to perform during a 72-hour sustained operation were that additional crewmen would effect a reduction in fatigue and stress problems ( $N = 85,90$ ); the additional men would provide improved local security ( $N = 63,54$ ); crew rotation would be possible ( $N = 65,60$ ); all tasks could be accomplished, resulting in a more efficient operation ( $N = 49,44$ ); and losses could be replaced immediately ( $N = 27,17$ ).

. Hindered Sustained Operations. Hindrances to the ability to perform during a 72-hour sustained operation were not described frequently enough to be reported.

Findings. Among the battalions in USAREUR, those that were augmented were described as being slightly more capable to perform adequately during a 72-hour sustained operation than those that were non-augmented. This increased capability was attributed primarily to a reduction in fatigue and stress problems, provision for local security, a capacity for crew rotation, and a source of replacements for losses.

Nonaugmented battalions in USAREUR were described during the first data collection phase as having a greater capability to perform adequately during a 72-hour sustained operation than battalions in CONUS, but there was no difference in their described capabilities during the second phase.

#### Unit Readiness

Primary Questionnaire Item. Battalion commanders, company commanders, platoon leaders, and platoon sergeants in both USAREUR and CONUS were asked to describe the overall state of combat readiness of their unit. A seven-point rating scale contained responses ranging from "extremely good" to "extremely bad."

. USAREUR. The mean corrected ratings of the overall state of combat readiness were 5.97 in battalions augmented at company level, 5.99 in battalions augmented at platoon level, and 5.61 in nonaugmented battalions. The analysis of variance resulted in a significant main effect for Battalion Type ( $F = 3.22$ ;  $df = 2,165$ ;  $p < .05$ ). The interactions between Battalion Type and the other factors were not statistically significant. A contrast between augmented and nonaugmented battalions showed that augmented battalions were rated significantly higher in combat readiness than nonaugmented battalions ( $F = 6.36$ ;  $df = 1,165$ ;  $p < .05$ ).

. CONUS. The mean ratings of the overall state of combat readiness were 5.40 in nonaugmented USAREUR battalions and 4.39 in CONUS battalions. The analysis of variance resulted in a significant main effect for Battalion Location ( $F = 21.07$ ;  $df = 1,110$ ;  $p < .05$ ). None of the interactions involving Battalion Location were statistically significant.

Secondary Questionnaire Items. The respondents answered five secondary questions pertaining to combat readiness. The first question pertained to the adequacy of the amount of MTOE equipment in their unit and was followed by a seven-point scale ranging from "extremely adequate" to "extremely inadequate." The second question asked respondents to describe the overall condition of this equipment on a seven-point scale ranging from "extremely good" to "extremely bad." The third question pertained to the adequacy of the number of tank crewmen available in their unit; it was followed by a seven-point scale ranging from "extremely adequate" to "extremely inadequate." The fourth question asked respondents to indicate how many of the tank crewmen in their unit were adequately trained for combat; this question was followed by a six-point scale ranging from "all" to "none." The fifth question asked respondents to describe the organic logistical support for combat in their unit; this question was followed by a seven-point scale ranging from "extremely good" to "extremely bad."

. USAREUR. The mean ratings for each of the secondary questions are summarized in Table 9 by battalion type.

The responses made on the secondary items indicate that the number of tank crewmen is perceived to be more adequate in augmented battalions than in nonaugmented battalions. The differences between augmented and nonaugmented battalions on other aspects of combat readiness were relatively small.

. CONUS. The mean ratings for each of the secondary questions are summarized in Table 10 by battalion location.

The responses made on the secondary items indicate that nonaugmented USAREUR battalions were perceived to be somewhat more adequate than CONUS battalions in all of the designated aspects of combat readiness.

Interview Questions. Respondents were asked two questions pertaining to combat readiness. The first question asked them to describe the ways in which the assignment of the additional tank crewmen increased the combat readiness of their unit, while the other asked them to describe the ways in which the assignment of the additional tank crewmen reduced

Table 9

## Mean Combat Readiness Ratings on Secondary Questions by Battalion Type

Secondary Question	Battalion Type		
	Augmented Company Level	Augmented Platoon Level	Nonaugmented
Amount of MTOE Equipment	6.10	6.26	6.00
Condition of MTOE Equipment	5.83	6.07	5.50
Number of Tank Crewmen	5.58	5.55	3.29
Number of Tank Crewmen Adequately Trained	4.41	4.47	4.04
Organic Logistical Support	4.93	5.12	4.70

Table 10

## Mean Combat Readiness Ratings on Secondary Questions by Battalion Location

Secondary Question	Battalion Location	
	USAREUR	CONUS
Amount of MTOE Equipment	6.00	5.46
Condition of MTOE Equipment	5.50	4.58
Number of Tank Crewmen	3.29	2.84
Number of Tank Crewmen Adequately Trained for Combat	4.04	3.38
Organic Logistical Support	4.70	4.27

the combat readiness. A total of 120 persons responded to these questions during the first data collection phase, while 119 responded during the second phase.

. Increased Combat Readiness. Increases in combat readiness were attributed to improved personnel status resulting from full crews (N = 80, 85); full, stabilized, better trained crews (N = 79, 77); better maintained equipment (N = 66, 75); and improved personnel, training, and logistical readiness (N = 58, 64).

. Reduced Combat Readiness. Ways in which the assignment of fifth crewmen might reduce combat readiness were not mentioned by the required number of respondents.

Findings. Although combat readiness in USAREUR was rated as good in both augmented and nonaugmented battalions, the ratings were significantly higher in augmented battalions. The responses made on the secondary questions indicate that this difference in rated combat readiness reflected differences in the number of tank crewmen in augmented and nonaugmented battalions. Increases in unit readiness were attributed primarily to the presence of full tank crews and to better maintained equipment.

Among the nonaugmented battalions, ratings of unit readiness were higher in USAREUR than in CONUS. The responses made on the secondary items indicated that this difference in unit readiness reflected moderate differences on all the designated aspects of unit readiness.

#### Administrative Reporting

Primary Questionnaire Item. Battalion commanders, battalion S1s, company commanders, and first sergeants in USAREUR were asked to describe the capacity of their battalion to adequately perform the administrative actions that are required within their unit. A seven-point rating scale contained responses ranging from "extremely capable" to "extremely incapable."

The analysis of variance did not result in a significant main effect for Battalion Type nor any significant interactions involving Battalion Type.

Secondary Questionnaire Items. Each battalion S1 was asked to provide an estimate of the number of SIDPERS transactions that occur in his battalion on a typical day as well as the number of pay inquiries, legal actions, leaves, disposition forms, Article 15s, serious incident reports, and administrative discharges that were processed in his battalion during the past 30 days. Because the analysis of the primary question pertaining to administrative reporting showed that there was no difference between augmented and nonaugmented battalions in their capabilities to perform required administrative actions, the responses made on the secondary questions were not considered.

Interview Questions. Respondents were asked during the interview to describe the effects that the additional tank crewmen had on the number of administrative reports that must be processed within their battalion. A total of 96 persons responded to this question during the first data collection phase, while 94 persons responded during the second phase.

Some respondents stated that the additional crewmen had no effects at all on the number of administrative reports that must be processed ( $N = 36,80$ ). No specific effects were reported by 10% or more of the respondents.

Findings. The results of the survey indicated that augmentation did not affect the overall capacity of units to perform the administrative actions that are required within the units.

#### Transportation

Primary Questionnaire Item. Battalion commanders, company commanders, and first sergeants were asked to rate the adequacy of the transportation resources that were available to their units. A seven-point rating scale contained responses ranging from "extremely adequate" to "extremely inadequate."

The analysis of variance did not result in a significant main effect for Battalion Type nor any significant interactions involving Battalion Type.

Secondary Questionnaire Items. There were no secondary questionnaire items pertaining to transportation assets.

Interview Questions. Respondents were given two questions pertaining to transportation assets. The first question asked the respondents to describe the effects the additional tank crewmen had on the availability of transportation within the battalion. The second question asked the respondents to describe what had been done in their unit to overcome the shortage of transportation, if any. A total of 84 persons responded to these questions during the first data collection phase, while 82 persons responded during the second phase.

Effects on Availability of Transportation. Some of the respondents stated that the additional crewmen had no effects on the availability of transportation ( $N = 54,66$ ). No specific effects were described by the minimum number of respondents.

Actions Taken to Overcome Transportation Shortages. It was frequently reported that no actions were taken within the unit to overcome any shortages of transportation ( $N = 41,63$ ). No specific actions were described by at least 10% of the respondents.

Findings. The availability of transportation was found not to be affected by the additional tank crewmen assigned to augmented battalions.

## Logistics

Primary Questionnaire Item. Battalion commanders, battalion S4s, company commanders, and first sergeants were asked to describe the support in their unit overall, not including transportation or administrative support. A seven-point rating scale contained responses ranging from "extremely adequate" to "extremely inadequate."

The mean ratings of the overall adequacy of support were 5.69 in battalions augmented at company level, 5.51 in battalions augmented at platoon level, and 4.99 in nonaugmented battalions. The analysis of variance resulted in a significant main effect for Battalion Type ( $F = 5.20$ ;  $df = 2,113$ ;  $p < .01$ ). None of the interactions involving Battalion Type were statistically significant. A contrast between augmented and nonaugmented battalions showed that support was rated significantly more adequate in augmented battalions than in nonaugmented battalions ( $F = 9.91$ ;  $df = 1,113$ ;  $p < .01$ ).

Secondary Questionnaire Items. Respondents answered six secondary questions pertaining to support problems. Each question required the respondents to rate the seriousness of a potential support problem in their unit. The problems were a shortage of troop billeting, shortage of TA-50, shortage of station property, insufficient mess facilities, inadequate installation support, and shortage of storage facilities. Each question was followed by a five-point rating scale with responses ranging from "very serious" to "not serious at all."

The mean ratings for each of the secondary questions are shown in Table 11 by battalion type.

The responses made on the secondary questions suggest that support was more adequate in the augmented battalions than in the nonaugmented battalions in terms of TA-50, mess facilities, and storage facilities.

Interview Questions. Respondents were asked to describe the effects that the additional tank crewmen had on support, not including administrative reporting and transportation. A total of 96 persons responded to this question during the first data collection phase, while 94 persons responded during the second phase.

It was reported during the interview that the additional tank crewmen created a billeting problem with lower morale resulting from overcrowding ( $N = 71,41$ ), and there were reported shortages of such items as protective masks, bedding, helmets, weapons, and TA-50 ( $N = 59,45$ ).

Findings. Overall support was described to be more adequate in augmented battalions than in nonaugmented battalions. Shortage of storage facilities, insufficient mess facilities, and shortage of TA-50 were reported, in particular, to be more serious in the nonaugmented battalions. Nevertheless, billeting problems, overcrowding, and shortages of various types of equipment were reported to result from the assignment of the additional tank crewmen in augmented battalions.

Table 11  
Mean Support Ratings on Secondary Questions  
by Battalion Type

Secondary Question	Battalion Type		
	Augmented Company Level	Augmented Platoon Level	Nonaugmented
Shortage of Troop Billeting	3.12	2.65	2.62
Shortage of TA-50	3.71	3.47	3.30
Shortage of Station Property	3.91	3.22	4.04
Insufficient Mess Facilities	4.27	4.57	4.10
Inadequate Installation Support	3.29	3.41	3.32
Shortage of Storage Facilities	3.67	3.53	2.82

Command and Control

Primary Questionnaire Item. Battalion commanders, company commanders, and platoon leaders were asked to describe the seriousness of the overall command and control problems that were being experienced by their unit. The five-point rating scale contained responses ranging from "not serious at all" to "very serious."

The analysis of variance did not result in a significant main effect for Battalion Type nor a significant interaction involving Battalion Type.

Secondary Questionnaire Items. Respondents answered seven secondary questions pertaining to command and control problems. Each question required the respondents to rate the seriousness of a potential command and control problem in their unit. The problems were a shortage of NCOs for supervising men, shortage of NCOs for developing training, shortage of NCOs for conducting training, difficulty in keeping men sufficiently busy, difficulty in keeping track of the men, shortage of NCOs for supervising maintenance, and lack of sufficient time by commanders for counseling men. Each question was followed by a five-point rating scale with responses ranging from "very serious" to "not serious at all." Because the analysis of the primary question showed that there was no difference between the augmented and nonaugmented battalions in the seriousness of overall command and control problems, the responses made on the secondary questions were not considered.

Interview Question. Respondents were asked during the interview to describe the effects of the additional crewmen on command and control problems within their unit. A total of 84 persons responded to this question during the first data collection phase, while 83 persons responded during the second phase.

The most frequent response given during the interview was that the additional crewmen had no effect on command and control problems ( $N = 66,53$ ). No specific effects were described by at least 10% of the respondents.

Findings. The results of the survey indicate that the assignment of additional crewmen to battalions did not create serious command and control problems.

#### Effects of the Assignment of Additional Tank Crewmen on Crewmen Themselves

##### Morale

Primary Questionnaire Items. Tank commanders, gunners, drivers, loaders, and assistant crewmen in USAREUR were given six Likert-type items pertaining to morale. Each item was a statement to which respondents expressed agreement or disagreement along a five-point scale ranging from "agree strongly" to "disagree strongly." Half of the items were written so that agreement with the statement indicated high morale, while the other half were written so that agreement indicated low morale. A composite morale score was obtained for each crewman by summing the values of the responses made on the six separate items.

Two analyses were conducted on the composite morale scores. The first analysis compared the morale scores of regular crewmen (not including assistant crewmen) in augmented units with those in nonaugmented units to determine whether the assignment of the fifth crewman had an impact on the morale of the other crewmembers. The second analysis compared the morale scores of the assistant crewmen with those of the other crewmen in augmented battalions in order to determine whether the morale of assistant crewmen differed from the morale of these other crewmen.

. Morale Among Regular Crewmen. The analysis of variance of the morale scores from regular crewmen did not result in a significant main effect for Battalion Type nor in a significant first-order interaction involving Battalion Type. However, a significant second-order interaction was obtained between Battalion Type, Position of Respondent, and Data Collection Phase ( $F = 3.16$ ;  $df = 6,201$ ;  $p < .01$ ).

As a result of the significant second-order interaction, separate fixed-model analyses of variance were performed for each data collection phase. During the first phase, a significant main effect was obtained for Battalion Type ( $F = 3.37$ ;  $df = 2,144$ ;  $p < .05$ ). The interaction between Battalion Type and Position of Respondent was not significant. The mean morale scores for regular tank crewmen were 3.53 in battalions augmented at company level, 3.61 in battalions augmented

at platoon level, and 3.28 in nonaugmented battalions. A contrast between the morale scores for regular crewmen in augmented battalions and those in nonaugmented battalions showed that the morale scores were significantly higher in augmented than in nonaugmented battalions ( $F = 4.04$ ;  $df = 1,144$ ;  $p < .05$ ).

In the analysis of the scores obtained during the second data collection phase, the main effect for Battalion Type was not statistically significant. However, a significant interaction was obtained between Battalion Type and Position of Respondent ( $F = 2.33$ ;  $df = 6,144$ ;  $p < .05$ ).

The mean morale scores obtained during the second data collection phase for each battalion type are summarized in Table 12 by position of respondent.

Table 12  
Mean Morale Scores During Phase 2 by Battalion Type  
and Position of Respondent

Position of Respondent	Battalion Type		
	Augmented Company Level	Augmented Platoon Level	Nonaugmented
Tank Commander	3.81	3.59	4.02
Gunner	3.42	3.28	3.30
Driver	2.85	3.92	2.80
Loader	3.51	3.36	3.35

The significant interaction between Battalion Type and Position of Respondent appears to reflect the higher morale scores obtained from drivers in battalions augmented at platoon level than from drivers in battalions augmented at company level or from those in nonaugmented battalions.

. Morale Among Crewmen in Augmented Battalions. The mean morale scores for tank crewmen in augmented units are shown in Table 13 by position of respondent.

The analysis of variance resulted in a significant main effect for Position of Respondent ( $F = 4.22$ ;  $df = 4,155$ ;  $p < .01$ ). The interaction between Position of Respondent and Type of Augmentation (company or platoon level) was not statistically significant. The results indicate that morale in augmented units is highest among tank commanders, and that there are only small differences in morale among crewmen in other positions.

Table 13

Mean Morale Scores in Augmented Units  
by Position of Respondent

Position of Respondent	Mean Morale Score
Tank Commander	3.88
Gunner	3.47
Driver	3.29
Loader	3.43
Assistant Crewman	3.35

Secondary Questionnaire Items. The survey contained no secondary questionnaire items pertaining to morale.

Interview Questions. The interviews contained no questions pertaining to morale.

Findings. The results of the survey indicate that the morale of regular tank crewmen (not including assistant crewmen) was slightly higher in the augmented battalions than in the nonaugmented battalions during the first data collection phase, but not during the second. The results also indicate that within augmented battalions, the morale of the assistant crewmen was similar to that of gunners, drivers, and loaders.

#### Second-String Feelings

Primary Questionnaire Items. Tank commanders, gunners, drivers, loaders, and assistant crewmen were given six Likert-type items pertaining to the degree to which the crewmen felt that they served an important function within the crew. Each item was a statement to which respondents expressed agreement or disagreement along a five-point scale ranging from "agree strongly" to "disagree strongly." Half of the items were written so that agreement with the statement indicated a high feeling of importance, while the other half were written so that agreement indicated a low feeling of importance. A composite function score was obtained for each tank crewman by summing the values of the responses made on the six separate items.

The analysis of the function scores compared the scores of the assistant crewmen with those of the other crewmen in augmented battalions in order to determine whether the assistant crewmen perceived their function within the crew as less important than the functions perceived by the other crewmembers.

The mean function scores are presented in Table 14 by position of respondent.

Table 14

Mean Function Scores in Augmented Units  
by Position of Respondent

Position of Respondent	Mean Function Score
Tank Commander	4.41
Gunner	4.28
Driver	4.05
Loader	3.98
Assistant Crewman	3.81

The analysis of variance resulted in a significant main effect for Position of Respondent ( $F = 8.29$ ;  $df = 4,155$ ;  $p < .01$ ). The interaction between Position of Respondent and Battalion Type was not statistically significant.

Secondary Questionnaire Items. There were no secondary questionnaire items pertaining to this issue.

Interview Questions. There were no interview questions pertaining to this issue.

Findings. The results of the survey indicate that tank commanders felt they served the most important function within the crew, and assistant crewmen felt they served the least important function.

Opinions Concerning Alternative Methods  
For Organizing The Additional Crewmen  
And Assigning Them to Units

Preference for Each Alternative Organization

Primary Questionnaire Items. Battalion commanders, company commanders, platoon leaders, and platoon sergeants in USAREUR were administered six primary questions dealing with five alternative organizations. The alternative organizations were:

1. 100% Fill - Providing no additional crew-member positions in the TOE, but filling each tank unit to 100% strength and providing for overlap of replacements to insure continuity.
2. Battalion Level Augmentation - Modifying the tank battalion TOE to provide for a 25% increase in the number of crewmember positions with these additional authorized personnel being under the control of battalion headquarters and being allocated to subordinate units as required.
3. Company Level Augmentation - Same as Battalion Level Augmentation except that the additional authorized personnel would be under the control of company headquarters.
4. Platoon Level Augmentation - Same as Battalion Level Augmentation except that the additional authorized personnel would be assigned to platoons.
5. Whole Crews - Modifying the tank battalion TOE to provide for a 25% increase in the number of whole tank crews with these additional crews being assigned at battalion, company, or platoon level under their respective control and allocated as required.

One question asked the respondent to select the one alternative organization which he most preferred. Since more than one alternative organization may have been perceived as acceptable to the respondents, even though they may not have been the most preferred, the respondents were asked in the remaining five questions to rate the acceptability of each of the five alternative organizations. Each of the five questions was followed by a seven-point scale ranging from "extremely acceptable" to "extremely unacceptable."

. Most Preferred Alternative Organization. The number of respondents who most preferred each of the five alternative organizations is shown in Table 15 for each data collection phase.

The alternative organization in which the additional crewmembers would be assigned to platoons was the most preferred during each of the two data collection phases, while the alternative organization in which additional crewmembers would be assigned to battalion headquarters was the least preferred. A chi-square test was conducted for each data collection phase to determine whether respondents in different positions differed in their preferences. A significant chi-square ( $\chi^2 = 25.62$ ;  $df = 12$ ;  $p < .05$ ) was obtained for the first data collection phase indicating that there were differences in preferences among respondents in different positions. The chi-square obtained for the second data collection phase was not statistically significant.

Table 15

## Number of Respondents Who Preferred Each Alternative Organization by Data Collection Phase

Data Collection Phase	Alternative Organization				
	100% Fill	Bn. Aug.	Co. Aug.	Plt. Aug.	Whole Crews
First	26(14%)	3( 2%)	22(12%)	115(64%)	13( 7%)
Second	26(15%)	3( 2%)	21(12%)	117(66%)	9( 5%)

The number of respondents selecting each of the five alternative organizations during the first data collection phase is shown in Table 16 by position of respondent.

Table 16

## Number of Respondents Who Preferred Each Alternative Organization During Phase I by Position of Respondent

Position of Respondent	Alternative Organization				
	100% Fill	Bn. Aug.	Co. Aug.	Plt. Aug.	Whole Crews
Battalion Commander	1( 6%)	2(11%)	3(17%)	10(56%)	2(11%)
Company Commander	2( 4%)	0( 0%)	9(17%)	38(70%)	4( 7%)
Platoon Leader	9(17%)	0( 0%)	6(11%)	36(67%)	3( 6%)
Platoon Sergeant	14(26%)	1( 2%)	4( 7%)	31(57%)	4( 7%)

During the first phase, there appears to be a greater preference by platoon leaders and platoon sergeants than by battalion commanders and company commanders for the alternative in which units are filled to 100% strength; there also appears to be a greater tendency by company commanders, platoon leaders, and platoon sergeants than by battalion commanders not to prefer augmentation at battalion level. While there also appears to be a difference between battalion commanders and other respondents in their preferences for augmentation at platoon level, this apparent difference reflects the fact that there were only one-third as many battalion commanders as company commanders, platoon leaders, or platoon sergeants in the sample. The proportion of battalion commanders who preferred platoon level augmentation was

approximately the same as the proportion of respondents in other positions who preferred this alternative organization.

Acceptability of Alternative Organizations. The mean acceptability rating for each alternative organization is shown in Table 17.

Table 17

Mean Acceptability Rating for Each Alternative Organization

Alternative Organization	Mean Acceptability Rating
100% Fill.	4.29
Battalion Level Augmentation	2.97
Company Level Augmentation	4.32
Platoon Level Augmentation	6.12
Whole Crews	4.02

[High values imply high acceptability.]

High acceptability ratings were given to augmentation at platoon level, low ratings were given to augmentation at battalion level, and intermediate ratings were given to the remaining three alternative organizations. The ratings were analyzed statistically using a fixed-model analysis of variance which included Alternative Organization as an additional factor. A significant main effect was obtained for Alternative Organization ( $F = 109.72$ ;  $df = 4,660$ ;  $p < .01$ ). In addition, significant interactions were obtained between Alternative Organization and Battalion Type ( $F = 2.02$ ;  $df = 8,660$ ;  $p < .05$ ) and between Alternative Organization and Position of Respondent ( $F = 3.07$ ;  $df = 12,660$ ;  $p < .01$ ). None of the other interactions involving Alternative Organization were statistically significant.

The mean acceptability ratings for each alternative organization are presented in Table 18 by battalion type.

The significant interaction between Alternative Organization and Battalion Type appears to reflect a greater tendency among respondents in nonaugmented battalions than in augmented battalions to accept the alternatives in which units are augmented at company level and in which they are filled to 100% strength.

The mean acceptability ratings for each alternative organization are presented in Table 19 by position of respondent.

Table 18

Mean Acceptability Ratings for Each Alternative Organization  
by Battalion Type

Battalion Type	Alternative Organization				
	100% Fill	Bn. Aug.	Co. Aug.	Plt. Aug.	Whole Crews
Augmented Company Level	4.12	2.78	3.87	6.22	3.87
Augmented Platoon Level	4.10	2.97	4.12	6.20	4.02
Nonaugmented	4.66	3.15	4.95	5.94	4.17

[High values imply high acceptability.]

Table 19

Mean Acceptability Ratings for Each Alternative Organization  
by Position of Respondent

Position of Respondent	Alternative Organization				
	100% Fill	Bn. Aug.	Co. Aug.	Plt. Aug.	Whole Crews
Battalion Commander	3.61	3.39	4.48	6.03	4.11
Company Commander	3.98	2.59	4.57	6.17	4.03
Platoon Leader	4.59	2.81	4.21	6.20	3.75
Platoon Sergeant	4.96	3.08	4.01	6.08	4.14

[High values imply high acceptability.]

The significant interaction between Alternative Organization and Position of Respondent appears to reflect a greater tendency by platoon leaders and platoon sergeants than by battalion commanders and company commanders to accept the alternative in which units are filled to 100% strength, a greater tendency by battalion commanders and company commanders than by platoon sergeants to accept the alternative in which units are augmented at company level, and a greater tendency by company commanders and platoon leaders than by battalion commanders to reject the alternative in which units are augmented at battalion level.

Secondary Questionnaire Items. There are no secondary questionnaire items pertaining to this issue.

Interview Questions. The interview contained ten questions pertaining to preferences for the five alternative organizations. Five of these questions asked respondents to describe some of the advantages for each of the alternative organizations, while the remaining five questions asked the respondents to describe some of the disadvantages. Interviewers probed for advantages and disadvantages pertaining to command and control, logistics, and training since they were the topics of other survey issues subsumed under Test Objective 3. Interviewers also probed for advantages and disadvantages pertaining to maintenance. A total of 180 persons responded during the first data collection phase to the interview questions pertaining to the five alternative organization, while 177 responded during the second phase. Only responses that do not pertain to communication and control, logistics, and training are summarized in this section of the report.

. 100% Fill - Advantages. Some respondents stated that there would be no advantages to the alternative in which units would be filled to 100% strength (N = 85,86). Among the remaining respondents, the opinion was expressed that the TOE would be good and workable if personnel strength were maintained (N = 27,25).

. 100% Fill - Disadvantages. Some respondents stated that there would be no disadvantages to this alternative organization (N = 30,20). Among the remaining respondents, the opinion was expressed that it would be unrealistic based on past performance (N = 79,81).

. Battalion Level Augmentation - Advantages. The opinion was expressed by some respondents that there would be no advantages to the alternative in which additional crewmen would be assigned to battalion headquarters (N = 120,151). Many of the remaining respondents stated that personnel would be provided for administrative details (N = 51,18).

. Battalion Level Augmentation - Disadvantages. The disadvantages given for this alternative were that the additional crewmen would be assigned continually to details (N = 74,76); the additional crewmen would lack personal pride since they would not have a crew with which to identify (N = 33,34); and they would have poor morale (N = 29,36).

. Company Level Augmentation - Advantages. Some respondents stated that there would be no advantages to the alternative in which additional crewmen would be assigned to company headquarters (N = 64,106). The opinions were expressed among the remaining respondents that this alternative would provide personnel for administrative details (N = 47,23) and would create a stable personnel situation (N = 45,25).

. Company Level Augmentation - Disadvantages. Opinions were expressed that the additional crewmen would not be assigned directly to tanks for training or maintenance (N = 93,63); the additional crewmen would be assigned continually to company details (N = 49,62); and the additional crewmen would lack personal pride since they would not have a crew with which to identify (N = 29,28).

. Platoon Level Augmentation - Advantages. The advantages anticipated for the alternative in which additional crewmen would be assigned to platoons were that the additional crewmen would be assigned directly to tanks ( $N = 119,119$ ); the crewmen would have pride in their tanks ( $N = 97,18$ ); and morale would be high among the additional crewmen since they would be assigned to tanks ( $N = 37,60$ ).

. Platoon Level Augmentation - Disadvantages. Some of the respondents stated that there would be no disadvantages for this alternative organization ( $N = 80,115$ ). No specific disadvantages were cited by at least 10% of the respondents.

. Whole Crews - Advantages. The opinion was given by some of the respondents that there would be no advantages to the alternative organization in which additional crewmen would be organized into whole crews ( $N = 111,129$ ). No specific advantages were cited by at least 10% of the respondents.

. Whole Crews - Disadvantages. The disadvantages anticipated for this alternative organization were that the crews would be broken up ( $N = 40,92$ ) and there would be no requirement for the replacement of full crews ( $N = 27,39$ ).

Findings. The results of the survey showed that there was a strong preference among the respondents for the alternative organization in which the additional crewmen would be assigned to platoons. The least preferred alternative was the organization in which the additional crewmen would be assigned to battalion headquarters. A major advantage attributed to platoon level augmentation was that it would enable crewmen to be assigned directly to tanks; this, in turn, was assumed to lead to greater pride in the vehicle itself. A major disadvantage attributed to battalion level augmentation was that the additional crewmen would be assigned to details continuously.

#### Preference for Additional Organizations

Primary Questionnaire Items. There were no primary questionnaire items pertaining to this survey issue.

Secondary Questionnaire Items. There were no secondary questionnaire items pertaining to this survey issue.

Interview Question. The interview contained one question pertaining to this survey issue. Respondents were asked to suggest other ways for organizing the additional crewmen if the number of crewmember positions in the TOE were to be increased. Few suggestions were made, and none were given by at least 10% of the respondents.

Among those that were given were the suggestions that security squads be provided, with the members of the squads serving as crew replacements as needed ( $N = 4,2$ ); a labor pool be assigned to the battalion or the TDA for non-mission tasks be increased, thereby freeing

tank crewmen for their regular duties ( $N = 3,1$ ); extra mechanics be assigned to units, and that these mechanics be used to replace drivers when needed ( $N = 2,0$ ); entire units be replaced when their strengths reach below a specified level ( $N = 1,0$ ); and battalions be rotated for one-year tours in USAREUR ( $N = 0,1$ ).

Findings. Few suggestions were made concerning additional ways of organizing the additional crewmen. Most suggestions involved labor pools in which persons could replace regular crewmembers when needed or could free the crewmembers from the necessity of performing non-mission related duties.

Command and Control, Logistics, and Training Problems Anticipated Under Each Alternative Organization

Primary Questionnaire Items. Battalion commanders, company commanders, platoon leaders, and platoon sergeants in USAREUR were administered three sets of primary questions pertaining to problems anticipated under each of the five alternative organizations. One set of questions pertained to command and control problems, another to logistics problems, and the final set to training problems. One question within each set asked the respondents to select the alternative organization which would result in the fewest problems of the designated type (i.e., command and control, logistics, and training) for their unit level. The respondents were asked in the remaining five questions within a set to rate the anticipated seriousness of the problems under each one of the five alternative organizations. Each of the five questions was followed by a five-point scale with responses ranging from "very serious" to "not serious at all."

. Alternative Organization with Fewest Problems. The number of respondents who selected each of the five alternative organizations as the one that would cause the fewest command and control, logistics, and training problems is shown in Table 20 by data collection phase,

The alternative organization in which additional crewmembers would be assigned to platoons was chosen most often during both data collection phases as the alternative that would cause the fewest command and control, logistics, and training problems, while the alternative in which units would be filled to 100% strength was the second most frequently chosen alternative. Non-significant chi-square tests showed that respondents in different positions did not differ in their selection of alternative organizations during either data collection phase.

. Seriousness of Problems. The mean ratings of the anticipated seriousness of overall command and control, logistics, and training problems in each alternative organization are shown in Table 21.

All three types of problems were anticipated to be least serious in units augmented at platoon level and in units filled to 100% strength, while they were anticipated to be most serious in units augmented at battalion level.

Table 20

Number of Respondents in Each Data Collection Phase  
 Selecting Each Alternative Organization As Causing  
 the Fewest Command and Control, Logistics, and  
 Training Problems

Type of Problem	Data Collection Phase	Alternative Organization				
		100% Fill	Bn. Aug.	Co. Aug.	Plt. Aug.	Whole Crews
Command and Control	First	42(23%)	4( 2%)	14( 8%)	103(57%)	17( 9%)
	Second	34(19%)	7( 4%)	15( 8%)	104(59%)	17(10%)
Logistics	First	54(30%)	19(11%)	17( 9%)	80(44%)	10( 6%)
	Second	63(36%)	13( 7%)	17(10%)	71(40%)	13( 7%)
Training	First	34(19%)	3( 2%)	21(12%)	109(61%)	13( 7%)
	Second	36(20%)	4( 2%)	19(11%)	102(58%)	15( 8%)

Table 21

Mean Ratings of Anticipated Seriousness of  
 Overall Command and Control, Logistics, and  
 Training Problems in Each Alternative Organization

Type of Problem	Alternative Organization				
	100% Fill	Bn. Aug.	Co. Aug.	Plt. Aug.	Whole Crews
Command and Control	4.34	2.72	3.50	4.61	3.80
Logistics	4.01	3.02	3.47	3.97	3.52
Training	4.18	2.79	3.60	4.53	3.62

[High values indicate low seriousness.]

Command and Control. The analysis of variance of the ratings of the anticipated seriousness of command and control problems resulted in a significant main effect for Alternative Organization ( $F = 146.16$ ;  $df = 4,660$ ;  $p < .01$ ), while significant interactions were obtained between Alternative Organization and Battalion Type ( $F = 3.00$ ;  $df = 8,660$ ;

$p < .01$ ) and between Alternative Organization and Position of Respondent ( $F = 1.84$ ;  $df = 12,660$ ;  $p < .05$ ). None of the other interactions involving Alternative Organization were statistically significant.

The mean seriousness ratings of command and control problems for each alternative organization are presented in Table 22 by battalion type.

Table 22

Mean Ratings of Anticipated Seriousness of Overall Command and Control Problems for Each Alternative Organization by Battalion Type

Battalion Type	Alternative Organization				
	100% Fill	Bn. Aug.	Co. Aug.	Plt. Aug.	Whole Crews
Augmented Company Level	4.38	2.65	3.24	4.67	3.72
Augmented Platoon Level	4.28	2.62	3.29	4.62	3.81
Nonaugmented	4.35	2.89	3.96	4.53	3.88

[High values imply low seriousness.]

The significant interaction between Alternative Organization and Battalion Type appears to reflect a greater tendency among respondents in augmented battalions than in nonaugmented battalions to anticipate serious command and control problems in units augmented at company level.

The mean serious ratings for each alternative organization are presented in Table 23 by position of respondent.

The interaction between Alternative Organization and Position of Respondent appears to be of little consequence in light of the very large difference between ratings of alternative organizations.

Logistics. The analysis of variance of the anticipated seriousness of logistics problems resulted in a significant main effect for Alternative Organization ( $F = 59.36$ ;  $df = 4,660$ ;  $p < .01$ ), while significant interactions were obtained between Alternative Organization and Battalion Type ( $F = 1.98$ ;  $df = 8,660$ ;  $p < .05$ ) and between Alternative Organization and Position of Respondent ( $F = 2.22$ ;  $df = 12,660$ ;  $p < .01$ ). None of the other interactions involving Alternative Organization were statistically significant.

The mean seriousness ratings for each alternative organization are presented in Table 24 by battalion type.

Table 23

Mean Ratings of Anticipated Seriousness of Overall Command and Control Problems in Each Alternative Organization by Position of Respondent

Position of Respondent	Alternative Organization				
	100% Fill	Bn. Aug.	Co. Aug.	Plt. Aug.	Whole Crews
Battalion Commander	4.56	2.56	3.44	4.72	3.61
Company Commander	4.41	2.52	3.43	4.51	3.74
Platoon Leader	4.10	2.86	3.62	4.52	3.85
Platoon Sergeant	4.23	2.84	3.45	4.64	3.96

[High values imply low seriousness.]

Table 24

Mean Ratings of Anticipated Seriousness of Overall Support Problems in Each Alternative Organization by Battalion Type

Battalion Type	Alternative Organization				
	100% Fill	Bn. Aug.	Co. Aug.	Plt. Aug.	Whole Crews
Augmented Company Level	4.17	3.06	3.49	4.10	3.55
Augmented Platoon Level	3.78	2.83	3.28	4.00	3.44
Nonaugmented	4.09	3.17	3.65	3.81	3.57

[High values indicate low seriousness.]

The interaction between Alternative Organization and Battalion Type appears to be of little consequence in light of the large difference between ratings of Alternative Organization.

The mean seriousness ratings for each alternative organization are presented in Table 25 by position of respondent.

The interaction between Alternative Organization and Position of Respondent also appears to be of little consequence.

Table 25

Mean Ratings of Anticipated Seriousness of Overall  
Support Problems in Each Alternative Organization  
by Position of Respondent

Position of Respondent	Alternative Organization				
	100% Fill	Bn. Aug.	Co. Aug.	Plt. Aug.	Whole Crews
Battalion Commander	4.30	2.98	3.66	4.16	3.66
Company Commander	4.01	2.75	3.28	3.80	3.30
Platoon Leader	3.81	3.25	3.52	3.83	3.56
Platoon Sergeant	3.87	2.99	3.36	3.98	3.44

[High values indicate low seriousness.]

Training. The analysis of variance of the ratings of the anticipated seriousness of training problems resulted in a significant main effect for Alternative Organization ( $F = 125.11$ ;  $df = 4,660$ ;  $p < .01$ ), and a significant interaction was obtained between Alternative Organization and Position of Respondent ( $F = 2.50$ ;  $df = 12,660$ ;  $p < .01$ ). None of the other interactions involving Alternative Organization were statistically significant.

The mean seriousness ratings for each alternative organization are shown in Table 26 by position of respondent.

Table 26

Mean Ratings of Anticipated Seriousness of Overall  
Training Problems in Each Alternative Organization  
by Position of Respondent

Position of Respondent	Alternative Organization				
	100% Fill	Bn. Aug.	Co. Aug.	Plt. Aug.	Whole Crews
Battalion Commander	4.39	2.72	3.64	4.72	3.33
Company Commander	4.22	2.52	3.65	4.54	3.54
Platoon Leader	4.02	2.95	3.62	4.42	3.74
Platoon Sergeant	4.06	2.84	3.43	4.38	3.74

[High values indicate low seriousness.]

The interaction between Alternative Organization and Position of Respondent appears to be of little consequence in light of the very large differences between ratings of alternative organizations.

Secondary Questionnaire Items. The respondents answered four sets of secondary questions pertaining to the anticipated seriousness of command and control problems in the five alternative organizations, one set pertaining to logistics problems, and six sets pertaining to training problems. Within each set, the respondents rated the anticipated seriousness of a designated problem for each one of the alternative organizations along a five-point rating scale with responses ranging from "very serious" to "not serious at all."

The four sets of secondary questions pertaining to the anticipated seriousness of command and control problems were:

1. Insufficient NCOs for supervising the additional crewmen.
2. Difficulty in keeping the additional crewmen busy.
3. Difficulty in keeping track of the additional crewmen.
4. Insufficient time for counseling the additional crewmen and handling their personal problems.

The secondary question pertaining to the anticipated seriousness of logistics problems was:

1. Insufficient housing for the additional tank crewmen.

The six sets of secondary questions pertaining to the anticipated seriousness of training problems were:

1. Complete crews not available for training.
2. Inadequate transportation to garrison training areas.
3. Inadequate transportation to field training areas.
4. Difficulty in scheduling training make-ups.
5. Shortage of tanks to meet training needs.
6. Insufficient space in tank for five crewmen.

The mean ratings on the secondary questions are presented in Table 27 for each of the five alternative organizations.

Table 27

Mean Ratings of the Anticipated Seriousness of Command and Control, Logistics, and Training Problems in Each Alternative Organization on Secondary Questions

Secondary Question	Alternative Organization				
	100% Fill	Bn. Aug.	Co. Aug.	Plt. Aug.	Whole Crews
<b>COMMAND AND CONTROL</b>					
Insufficient NCOs for supervising additional crewmen	3.91	2.68	3.29	4.31	3.75
Keeping the additional crewmen busy	4.38	2.95	3.69	4.55	3.64
Keeping track of the additional crewmen	4.38	2.80	3.62	4.62	3.89
Insufficient time for counseling the additional crewmen	4.18	2.76	3.34	4.32	3.69
<b>LOGISTICS</b>					
Insufficient housing for the additional crewmen	3.36	2.30	2.70	3.01	2.66
<b>TRAINING</b>					
Complete crews not available for training	3.48	2.91	3.68	4.51	3.59
Inadequate transportation to garrison training areas	4.30	3.54	3.92	4.32	3.89
Inadequate transportation to field training areas	4.32	3.23	3.67	4.23	3.65
Difficulty in scheduling training make-ups	4.04	2.87	3.67	4.37	3.75
Shortage of tanks to meet training needs	4.48	3.21	3.88	4.55	3.45
Insufficient space in tank for five crewmen	4.16	3.14	3.32	3.60	3.24

[High values indicate low seriousness.]

The responses made on the secondary questions indicate that almost all problems were anticipated to be least serious in units augmented at platoon level and in units filled to 100% strength, of intermediate seriousness in units augmented at company level and in units augmented

with whole crews, and most serious in units augmented at battalion level. One exception involved the 100% fill alternative in which not having complete crews for training was anticipated to be a somewhat serious problem. Another exception involved platoon level augmentation in which insufficient space for five crewmen was anticipated to be a somewhat serious training problem.

Interview Questions. Responses pertaining to the seriousness of command and control, logistics, and training problems were obtained during the portion of the interview in which respondents were asked to describe some of the advantages and disadvantages for each of the five alternatives. Interviewers probed for advantages and disadvantages pertaining to these issues when they were not otherwise given by the respondents.

. 100% Fill - Advantages.

Command and Control. The opinion was expressed that this alternative was the simplest of the five alternative organizations (N = 20,33).

Logistics. No advantage pertaining to logistics were given by at least 10% of the respondents.

Training. No advantages pertaining to training were expressed for this alternative organization.

. 100% Fill - Disadvantages.

Command and Control. No disadvantages pertaining to command and control were anticipated for this alternative organization.

Logistics. The opinions were expressed for this alternative that it would not provide enough people to make up for daily absences (N = 112,120) and it could not be supported by the personnel system (N = 60,79).

Training. The required number of respondents did not cite any disadvantages pertaining to training.

. Battalion Level Augmentation - Advantages.

Command and Control. No advantages pertaining to command and control were anticipated for battalion level augmentation.

Logistics. No advantages pertaining to logistics were anticipated for this alternative organization.

Training. No advantages pertaining to training were anticipated.

. Battalion Level Augmentation - Disadvantages.

Command and Control. The disadvantages cited for this alternative organization were that Headquarters Company does not have supervisory personnel (N = 127,93) and the additional crewmen would not be assigned to the level at which they would perform (N = 38,40).

Logistics. No specific disadvantages pertaining to logistics were anticipated for battalion level augmentation by at least 10% of the respondents.

Training. The disadvantages given for battalion level augmentation were that the Headquarters Company does not have training assets ( $N = 131,115$ ); the additional crewmen could not be assigned to tanks for training and maintenance ( $N = 106,87$ ); and Headquarters Company does not have tanks on which the men could train ( $N = 72,39$ ).

• Company Level Augmentation - Advantages.

Command and Control. The opinion was expressed that company level augmentation would provide more direct supervision than battalion level augmentation ( $N = 54,31$ ).

Logistics. No advantages pertaining to logistics were expressed for company level augmentation.

Training. No specific advantages pertaining to training were given for company level augmentation by the required number of respondents.

• Company Level Augmentation - Disadvantages.

Command and Control. The disadvantages given for this alternative organization were that Headquarters Platoon does not have the NCOs to supervise the additional crewmen ( $N = 111,106$ ) and the additional crewmen would not be assigned to the level at which they would perform ( $N = 50,62$ ).

Logistics. The opinion was expressed that the TOE for the Headquarters Platoon could not support 17 additional crewmen ( $N = 66,23$ ).

Training. The disadvantages were expressed that the Headquarters Platoon does not have the training assets that are found in the tank platoons ( $N = 101,107$ ) and the additional crewmen could not be assigned directly to tanks for training and maintenance ( $N = 93,63$ ).

• Platoon Level Augmentation - Advantages.

Command and Control. The advantage expressed for platoon level augmentation was that platoon sergeants and tank commanders would be direct supervisors ( $N = 145,112$ ).

Logistics. The required number of respondents did not describe any advantages pertaining to logistics.

Training. The advantage expressed for platoon level augmentation was that the best training assets would be available at platoon level ( $N = 135,111$ ).

• Platoon Level Augmentation - Disadvantages.

Command and Control. No disadvantages pertaining to command and control were anticipated for platoon level augmentation by at least 10% of the respondents.

Logistics. The opinion was expressed that there could be a transportation problem if the additional crewmen were in excess of 100% of the TOE (N = 61,26).

Training. No disadvantages pertaining to training were given for platoon level augmentation by the required number of respondents.

• Whole Crews - Advantages.

Command and Control. The required number of respondents failed to cite any advantages pertaining to command and control for the whole crew alternative.

Logistics. No advantages pertaining to logistics were given for this alternative organization.

Training. No specific advantages pertaining to training were reported for this alternative organization by at least 10% of the respondents.

• Whole Crews - Disadvantages.

Command and Control. The required number of respondents did not describe any specific disadvantages pertaining to command and control.

Logistics. The disadvantage reported for this alternative organization was that the additional whole crews would have no assigned tanks (N = 131,89).

Training. The disadvantage given for this alternative organization was that no tanks would be available for training (N = 131,105).

• Findings. The fewest and least serious command and control, logistics, and training problems were anticipated in units augmented at platoon level and in units filled to 100% strength. The most serious problems were anticipated in units augmented at battalion level. The major advantages perceived for platoon level augmentation were the direct supervision provided by platoon sergeants and tank commanders and the availability of training assets within the platoon, while simplicity was the major advantage attributed to the alternative in which units are filled to 100% strength. The major disadvantages attributed to battalion level augmentation were the lack of NCOs for supervising the additional crewmen and the lack of training assets in the Headquarters Company, particularly the lack of tanks for training and maintenance.

Judgments of the Number of Additional Crewmen  
Needed to Enable a Platoon to Fully Man Its Tanks

Primary Questionnaire Items

Battalion commanders, company commanders, platoon leaders, and platoon sergeants were asked how many additional tank crewmen would be needed in five different grade/skill categories to enable the tank platoon to fully man its tanks. The five grade/skill categories were 19E30, 19E20, 19E10, 19F20, and 19F10. The restriction was imposed upon the respondents that the total number of additional crewmen not exceed five.

The mean number of additional crewmen that were believed necessary to enable the platoon to fully man its tanks is presented in Table 28 by grade/skill category for each data collection phase.

Table 28

Mean Number of Additional Crewmen At Each Grade/Skill Level  
Believed Necessary in Each Data Collection Phase  
To Enable a Tank Platoon To Fully Man Its Tanks

Grade/Skill Level	Data Collection Phase	
	First	Second
19E30	0.3	0.4
19E20	1.0	1.2
19E10	1.8	1.8
19F20	0.6	0.6
19F10	1.0	1.1

Secondary Questionnaire Items

The questionnaire contained no secondary questionnaire items pertaining to this survey issue.

Interview Questions

The respondents were asked during the interview to explain why they had recommended on the questionnaire the particular number of additional crewmen in each grade/skill category. The respondents stated that the recommended number of 19E10s and 19F10s was given

because replacements were needed at the lower grade levels ( $N = 48,63$ ); the recommended number of 19E30s was given because it provided additional NCOs ( $N = 26,30$ ); the recommended number of 19F20s and 19F10s was given because driver replacements were required ( $N = 26,26$ ); the recommended number of 19E20s and 19E10s was given because gunner replacements were needed ( $N = 30,44$ ); and the recommended number of additional crewmen in each grade/skill category was given because replacements would be provided where they were needed ( $N = 83,68$ ).

### Findings

On the average, the number of additional crewmen recommended as necessary to enable a tank platoon to fully man its tanks were one 19E20, two 19E10s, one 19F10, and a fifth person who could be either a 19F20 or a 19E30 with a slightly greater need expressed for a 19F20 than a 19E30.

### Crew Turbulence

#### Turbulence Rate

Primary Questionnaire Items. Battalion commanders, company commanders, platoon leaders, and platoon sergeants in both USAREUR and CONUS were administered two primary questions dealing with the perceived amount of turbulence in their units. One question dealt with the amount of position turbulence (rate at which personnel change from one duty position to another within the same crew), while the other dealt with the amount of personnel turbulence (rate at which personnel change from one crew to another, keeping the same duty position). Each question was followed by a five-point rating scale with responses ranging from "none" to "great amount."

. USAREUR. The mean turbulence rates (combining position and personnel turbulence) were 3.36 in battalions augmented at company level, 3.25 in battalions augmented at platoon level, and 2.87 in nonaugmented battalions. Because higher scale values on these items indicate lower turbulence rates, these means show that turbulence was perceived to be higher in nonaugmented battalions than in augmented battalions.

The ratings were analyzed statistically using a fixed-model analysis of variance which included Type of Turbulence as an additional factor. A significant main effect was obtained for Battalion Type ( $F = 8.23$ ;  $df = 2,165$ ;  $p < .01$ ), but none of the interactions involving Battalion Type were statistically significant. A contrast of mean turbulence rates showed that there was significantly less turbulence perceived in augmented than in nonaugmented battalions ( $F = 7.92$ ;  $df = 1,165$ ;  $p < .01$ ).

. CONUS. Turbulence rates from nonaugmented battalions in USAREUR and CONUS were analyzed statistically using an analysis of variance which included Type of Turbulence as an additional factor. Neither the main effect for Battalion Location nor any of the interactions involving Battalion Location were statistically significant.

Secondary Questionnaire Items. Platoon leaders in USAREUR were asked four sets of questions pertaining to the crewmen in their platoon's #3 tanks. Each set pertained to one of the four regular positions within the tanks, and contained three questions. One question asked the number of months the crewman in the position had been in the company. The second question asked how long the crewman had been in the crew. The third question asked how long the crewman had been in the same position, regardless of the tank or crew to which he had been assigned. In addition, company commanders were asked how many months ago their company last fired Tables VIII and IX.

Required and Other Turbulence. Based on their platoon leader's responses on the four sets of secondary questions, each crewman in the #3 tank was categorized according to the type of turbulence he had experienced since being assigned to the company. All crewmembers who had been assigned to the same crew and to the same position since entering the company were categorized as having experienced no turbulence. The second category, required turbulence, was based on the assumption that some changes in assignment were necessary in order to fill vacated positions within the company. Included in this category were all crewmen who had been transferred from a position in one crew to a different position in a second crew since entering the company, but who had experienced no other assignment changes. Also included in the required turbulence category were all crewmen who had been in the same crew since entering the company, but who had experienced a change in position. The third category, other turbulence, was based on the assumption that multiple changes in assignment, although occasionally justified (e.g., for disciplinary reasons, mission requirements, and elimination of personality conflicts), were the least preferred means of maintaining crews. Included in this category were crewmen who had transferred from one crew to another since entering the company, and were later changed from one position to another within the new crew. Also included in this category were crewmen who were changed from one position to another within a crew, and were later transferred to another crew.

Table 29 presents the percentage of crewmen within each position who had experienced each type of turbulence. Almost half of the crewmen had experienced no turbulence at all. Slightly more than one-fourth of the crewmen had experienced required turbulence, while slightly less than one-fourth had experienced other turbulence. Among the crewmen in different positions, gunners had experienced the greatest amount of required turbulence.

Effects of Crew Qualification on Turbulence. Based on the responses given by company commanders to the question asking when their company last fired Tables VIII and IX, units were separated into those who had undergone tank crew qualification during the three months prior to the questionnaire administration, and those who had undergone qualification more than three months prior to the questionnaire administration. Table 30 shows the percentage of crewmen in each position who had experienced each type of turbulence in the two types of units. A higher percentage of the crewmen experienced no turbulence and fewer experienced multiple assignment changes in the units that had undergone tank crew qualification during the three months prior to the questionnaire administration.

Table 29

Percentage of Tank Crewmen Experiencing  
Various Types of Turbulence

Crewman Position	Type of Turbulence		
	No	Required	Other
Tank Commander	45%(22)*	24%(12)	31%(15)
Gunner	31%(16)	47%(24)	22%(11)
Driver	55%(24)	16%( 7)	30%(13)
Loader	62%(26)	29%(12)	10%( 4)
Average	48%	29%	23%

\*Number in parentheses indicates number of respondents in the category.

Table 30

Percentage of Tank Crewmen Experiencing  
Various Types of Turbulence by Number of Months  
Since Tank Crew Qualification

Crewman Position	Months Since Tank Crew Qualification	Type of Turbulence		
		No	Required	Other
Tank Commander	0-3	47%(16)*	24%( 8)	29%(10)
	4 or more	40%( 6)	27%( 4)	33%( 5)
Gunner	0-3	37%(13)	46%(16)	17%( 6)
	4 or more	19%( 3)	50%( 8)	31%( 5)
Driver	0-3	61%(19)	19%( 6)	19%( 6)
	4 or more	38%( 5)	8%( 1)	54%( 7)
Loader	0-3	57%(16)	32%( 9)	11%( 3)
	4 or more	71%(10)	21%( 3)	7%( 1)
Average	0-3	51%	30%	19%
	4 or more	42%	27%	31%

\*Number in parentheses indicates number of respondents in the category.

Interview Questions. The interviews contained no questions pertaining to turbulence rate.

Findings. The results of the survey indicate that turbulence rates in USAREUR are perceived to be lower in augmented than in non-augmented battalions. The results also indicate that there are no differences between perceived turbulence rates among battalions in CONUS and those among nonaugmented battalions in USAREUR. The percentage of crewmen in USAREUR experiencing no turbulence was higher and the percentage experiencing multiple assignment changes was lower in units having recently undergone tank crew qualification (during the prior three months) than in units not having recently undergone tank crew qualification.

#### Effects of Turbulence on Unit Performance

Primary Questionnaire Items. Battalion commanders, company commanders, platoon leaders, and platoon sergeants in both USAREUR and CONUS were administered four primary questions dealing with the effects of turbulence on unit performance. Two of the items pertained to the effects of turbulence on training, while the other two pertained to its effects on maintenance. Within each of these pairs of questions, one item pertained to the effects of position turbulence, while the other pertained to the effects of personnel turbulence. Each question was followed by a seven-point scale ranging from "improves it a great deal" to "degrades it a great deal."

USAREUR. The questions dealing with training and those dealing with maintenance were analyzed separately.

Training. The mean rating of the effects of position turbulence on training was 4.26, while the mean rating of the effects of personnel turbulence was 3.30. The ratings were analyzed using a fixed-model analysis of variance which included Type of Turbulence as an additional factor. A significant main effect was obtained for Type of Turbulence ( $F = 92.56$ ;  $df = 1,165$ ;  $p < .01$ ), and a significant interaction was obtained between Type of Turbulence and Position of Respondent ( $F = 4.83$ ;  $df = 3,165$ ;  $p < .01$ ). None of the other interactions involving Type of Turbulence were statistically significant.

The mean ratings of the effects of position and personnel turbulence on training are shown in Table 31 by position of respondent.

The significant interaction between Type of Turbulence and Position of Respondent reflects the tendency by platoon leaders and platoon sergeants to perceive larger differences between the effects of position and personnel turbulence on training than are perceived by battalion commanders and company commanders. Platoon leaders and platoon sergeants believed that position turbulence improves training, while battalion commanders and company commanders believed that position turbulence degrades training. Furthermore, although respondents in all positions perceived personnel turbulence to be degrading, it was perceived to be more degrading by battalion commanders and company commanders than by platoon leaders and platoon sergeants.

Table 31

Mean Ratings of the Effects of Position and Personnel Turbulence on Training in USAREUR by Position of Respondent

Position of Respondent	Type of Turbulence	
	Position	Personnel
Battalion Commander	3.39	2.86
Company Commander	3.74	2.94
Platoon Leader	4.92	3.55
Platoon Sergeant	5.42	3.85

Maintenance. The mean rating of the effects of position turbulence on maintenance was 4.07, while the mean rating of the effects of personnel turbulence was 3.43. These means show that position turbulence was perceived to have no effect on maintenance, while personnel turbulence was perceived to degrade maintenance slightly.

The analysis of variance resulted in a significant main effect for Type of Turbulence ( $F = 63.30$ ;  $df = 1,165$ ;  $p < .01$ ). None of the interactions involving Type of Turbulence were statistically significant.

. CONUS.

Training. The mean rating of the effects of position turbulence on training was 4.08, while the mean rating of the effects of personnel turbulence was 3.24. The analysis of variance resulted in a significant main effect for Type of Turbulence ( $F = 34.84$ ;  $df = 1,110$ ;  $p < .01$ ), and a significant interaction was obtained between Type of Turbulence and Position of Respondent ( $F = 3.12$ ;  $df = 3,110$ ;  $p < .05$ ). None of the other interactions involving Type of Turbulence were statistically significant.

The mean ratings of the effects of position and personnel turbulence on training are shown in Table 32 by position of respondent.

As in the analysis of the USAREUR data, the significant interaction between Type of Turbulence and Position of Respondent reflects the tendency by platoon leaders and platoon sergeants to perceive larger differences between the effects of position and personnel turbulence on training than are perceived by battalion commanders and company commanders. Platoon leaders and platoon sergeants believed that position turbulence improves training, while battalion commanders and company commanders believed that it degrades training. Furthermore, although respondents in all positions perceived personnel turbulence to be degrading, it was perceived to be more degrading by battalion commanders, company commanders, and platoon leaders than by platoon sergeants.

Table 32

Mean Rating of the Effects of Position and Personnel Turbulence on Training in Nonaugmented Units by Position of Respondent

Position of Respondent	Type of Turbulence	
	Position	Personnel
Battalion Commander	3.33	3.12
Company Commander	3.46	2.86
Platoon Leader	4.50	3.29
Platoon Sergeant	5.01	3.71

Maintenance. The mean rating of the effects of position turbulence on maintenance was 3.89, while the mean rating of the effects of personnel turbulence was 3.27. These means show that position turbulence was perceived to have no effect on maintenance, while personnel turbulence was perceived to degrade maintenance slightly. The analysis of variance resulted in a significant main effect for Type of Turbulence ( $F = 38.25$ ;  $df = 1,110$ ;  $p < .01$ ). None of the interactions involving Type of Turbulence were statistically significant.

Secondary Questionnaire Items. Company commanders in USAREUR were asked four secondary questions pertaining to the effects of turbulence on unit performance. Two of the questions dealt with estimated personnel turbulence within the company. One question asked the company commander to estimate how many months the tank commanders, gunners, drivers, and loaders had typically been assigned together in the same crew when his company last fired Tables VIII and IX. The other question asked the company commander to estimate how many months the tank commanders and gunners had typically been assigned together in the same crew when his company last fired Tables VIII and IX. The other two questions dealt with his company's performance during tank crew qualification. One question asked the company commander to estimate the number of crews that scored red, amber, and green on Table VIII, while the other asked him to estimate the number of platoons that scored red, amber, and green on Table IX.

Correlation coefficients were computed between each estimate of personnel turbulence and the number of crews or platoons that were estimated to have scored green on Table VIII and IX. Correlation coefficients were also computed between the two estimates of personnel turbulence and the number of crews or platoons that were estimated to have qualified on Tables VIII and IX (i.e., scored either green or amber). The resulting correlation coefficients are contained in Table 33. None of the correlations were statistically significant.

Table 33

Correlation Coefficients Between Estimated Number  
of Months Crewmen were Typically Assigned to Their Crews  
and Estimated Unit Performance

Estimated Unit Performance	Estimated Number of Months Crewmen Were Typically Assigned to Their Crews*	
	Whole Crew	Tank Commander and Gunner Only
Number of Crews Scoring Green on Table VIII	.28	.12
Number of Platoons Scoring Green on Table IX	.17	.15
Number of Crews Qualified on Table VIII	.25	.14
Number of Crews Qualified on Table IX	.16	.00

\*Number of respondents for each correlation was 41.

Interview Questions. The interview contained five questions pertaining to this survey issue. The first question asked the respondent to explain his statement on the questionnaire that turbulence degrades or improves training. The second question asked the respondent to explain his statement on the questionnaire that turbulence degrades or improves maintenance. The third question asked the respondent to describe the techniques that he applied to reduce turbulence. The fourth question asked what other techniques could be used by someone in his position to reduce turbulence. The final question asked for any other comments pertaining to turbulence. A total of 180 persons responded to these questions during the first data collection phase, while 176 responded during the second data collection phase.

. Training. Among the respondents who expressed the opinion that turbulence improves training, the most commonly given explanation for this effect was that turbulence facilitates cross training ( $N = 105, 93$ ). Among those who expressed the opinion that turbulence degrades training, the most commonly given explanations were that turbulence disrupts continuity ( $N = 79, 88$ ), disrupts crew integrity ( $N = 64, 79$ ), and hinders crew coordination ( $N = 61, 76$ ).

. Maintenance. Among the respondents who stated that turbulence improves maintenance, the explanation was given that turbulence facilitates cross training ( $N = 44, 58$ ). Among those who felt that it degrades training, the reasons given were that replacements interfere with the performance of maintenance by regular crewmembers ( $N = 86, 44$ ) and that turbulence creates a loss of pride in the vehicle ( $N = 36, 42$ ).

. Techniques Used to Reduce Turbulence. The most frequently reported measures that were used to reduce turbulence were making increased efforts not to transfer people within a company (N = 107,77), requiring approval from battalion, company, and platoon for all crew changes (N = 102,89), increasing the accountability of personnel by subordinates (N = 43,71), and monitoring all crew changes (N = 34,86). Some respondents reported that they took no actions to reduce turbulence (N = 12,43).

. Other Techniques for Reducing Turbulence. A majority of the respondents stated that there were no other techniques that could be used to reduce turbulence (N = 104,171).

. Other Comments Regarding Turbulence. A majority of the respondents stated that they had no other comments to make concerning turbulence (N = 117,170).

Findings. The results of the survey showed that personnel turbulence had no effect on tank crew qualification or platoon qualification, but was perceived to have a modest detrimental effect on both training and maintenance. Position turbulence was judged by platoon leaders and platoon sergeants to have a positive effect on training, but by battalion commanders and company commanders to have a slight negative effect. Position turbulence was perceived to have no effect on maintenance.

The primary benefit of turbulence was seen to be the opportunity to provide cross training. The detrimental effects were attributed primarily to disruption of the crew and a subsequent loss of pride in the crew or tank. Techniques that were used to reduce turbulence included making efforts not to transfer men within the company, requiring approval for all crew changes, increasing accountability of personnel, and monitoring all crew changes.

## DISCUSSION

### Effects of Additional Tank Crewmen on Unit Performance

A major purpose of the "Fifth Tank Crewman" survey was to determine the effects of additional tank crewmen on reported unit performance. These effects were assessed by comparing ratings of performance in units augmented with additional crewmen with ratings in units that were not augmented in strength. The comparisons, which are summarized in Table 34, indicated that the assignment of additional crewmen to tank battalions resulted in significant improvements in rated quality of training, capability to perform adequately during a 72-hour sustained operation, unit readiness, and logistics. The assignment of the additional tank crewmen was also found to result in improved maintenance, but this improvement did not appear until the second data collection phase. The assignment of the additional crewmen was also found to result in a decrease in reported turbulence. On the other hand, the assignment of the additional crewmen did not result in a reported increase in command and control problems or in administrative reports. Also, transportation resources were reported to be equally adequate in augmented and nonaugmented units.

The reported improvements in unit performance were attributed primarily to the presence of the additional tank crewmen. Improvements in training, for example, were reported to have resulted from increases in class size and from greater crew stability; the improvement in the capability to perform adequately during a sustained operation was reported to be due to a reduction in fatigue, better security, crew rotation, and replacement of personnel losses; improvements in unit readiness were reported to be the result of having full crews, improved crew stability, and better maintained equipment; improvements in maintenance during the second data collection phase were reported to be due to the availability of additional men for performing day-to-day crew maintenance and for assisting in the performance of quarterly services. In all these cases, it is clear that the assignment of the additional crewmen were directly or indirectly the major cause for the improvement. Moreover, except for some reported logistics problems, these improvements were reported to have been obtained without imposing any undue burdens upon the augmented units.

### Effects of Additional Crewmen on Morale and "Second-String" Feelings

The effects of the assignment of the additional crewmen on the morale of the crewmen were inconclusive. While the morale of the crewmen in augmented units was higher than the morale of men in nonaugmented units during the first data collection phase, no difference was found in the morale of the men in the two types of units during the second data collection phase. It is possible that morale improved at first because the crewmen initially compared their situation with the additional crewmen to their situation without the additional crewmen. With the passage of time, however, the assignment of the additional crewmen could have

Table 34

Judged Effects of Additional  
Tank Crewmen on Unit Performance

Type of Unit Performance	Effect	Reported Cause
Maintenance	Improvement during Phase 2 only	<ul style="list-style-type: none"> <li>More men to perform day-to-day crew maintenance.</li> <li>More men to assist in performance of quarterly services.</li> <li>Sufficient personnel to perform heavy tasks.</li> <li>Greater stabilization of crewmembers.</li> <li>Maintenance performed in less time.</li> </ul>
Training	Improvement	<ul style="list-style-type: none"> <li>More men available for training.</li> <li>Improved crew coordination.</li> <li>Improved crew stability.</li> </ul>
Sustained Operations	Improvement	<ul style="list-style-type: none"> <li>Reduction in fatigue and stress problems.</li> <li>Improved local security.</li> <li>Crew rotation facilitated.</li> </ul>
Combat Readiness	Improvement	<ul style="list-style-type: none"> <li>Full tank crews.</li> <li>Stable and trained crews.</li> <li>Better maintained equipment.</li> </ul>
Administrative Reporting	No Effect	
Transportation	No Effect	
Logistics	Improvement	<ul style="list-style-type: none"> <li>No causes reported.</li> </ul>
Command and Control	No Effect	
Turbulence Rate	Improvement	<ul style="list-style-type: none"> <li>Not asked in survey.</li> </ul>

become less salient, and perhaps the crewmembers no longer compared their situation to the situation prior to the assignment of the additional crewmen. Another possible explanation for the lack of improved morale during the second data collection phase is that the improvements caused by the assignment of the additional men were not as great as were anticipated by the crewmembers. During the first phase, it is possible that the crewmen in augmented units anticipated that their workload would become greatly reduced by the presence of the additional men. Thus, morale showed a significant improvement. If the workload remained high, even though it could have been reduced in magnitude, the failure to achieve the expected reductions may have caused morale to deteriorate. Finally, it is possible that the failure to find a difference in morale during the second data collection phase may be due to an improvement in morale among the crewmen in nonaugmented units rather than to a decrease in morale among the crewmen in augmented units. Both augmented and nonaugmented units in USAREUR experienced an increase in personnel strength. While augmented units were increased to 125% of TOE strength, the nonaugmented units were increased to 100% of TOE strength. It is possible that both increases led to an improvement in morale, but that the increase took longer to manifest itself in the nonaugmented units because the increase in personnel strength was less obvious.

Examination of the morale data suggests that all three explanations are tenable. Both the first explanation (that crewmen during the second data collection phase no longer compared their situation to that prior to the assignment of the additional crewmen) and the second (that improvements were not as great as anticipated) are supported by the fact that the mean morale score in augmented battalions decreased from 3.57 during Phase 1 to 3.47 during Phase 2. The third explanation (that the increase in personnel to 100% of TOE strength improved morale in nonaugmented battalions) is supported by the fact that the mean morale score in nonaugmented battalion increased from 3.28 during Phase 1 to 3.37 during Phase 2. Perhaps it was a combination of these effects that resulted in a difference in morale among crewmen in augmented and non-augmented battalions only during the first data collection phase.

An important consideration in the assignment of "fifth crewmen" to armor units is the effects of this assignment on the fifth crewman himself. By not being a regular member of a tank crew, it is possible that the fifth crewman could have lower morale and that he would not perceive his function within the unit to be important. The results of the survey indicate that the morale of the "fifth crewmen," while lower than that of tank commanders, was similar to that of the other crewmen. On the other hand, it was found that the "fifth crewmen" did perceive their function within the crew to be the least important.

#### Preference for Alternative Organizations

Another important consideration in the assignment of additional crewmen to armor units is the method devised to organize these men and the organizational level to which they would be assigned. During the present survey, respondents were asked to judge the acceptability of five alternative organizations for the fifth tank crewmen and to

anticipate the advantages and disadvantages of each. The preference among the five alternative organizations and comments on each are summarized in Table 35.

Platoon level augmentation was clearly the most preferred of the five alternative organizations. This preference appeared to be due to the greater availability of NCOs for supervising men and to the availability of training assets, including tanks, within the platoon. The alternative organization in which units would be filled to 100% strength was also rated highly, but no reasons were given except for its simplicity. Battalion level augmentation was the least preferred of the five alternative organizations. This lack of preference appeared to be due to the lack of supervisory personnel within Headquarters Company, the lack of training assets within Headquarters Company, the lack of pride and low morale that would result from not being a regular member of a crew, and from the high likelihood that the additional crewmen would be continuously assigned by the battalion to details.

#### Judgments of Required Number of Additional Crewmen

In specifying by grade/skill level the number of additional crewmen that would be necessary to enable a platoon to fully man its tanks, the respondents showed a decided preference for men at the lowest grade level. They explained this preference by stating that replacements were most needed at this level. Almost twice as many 19E10s as 19E20s and twice as many 19F10s as 19F20s were reported necessary. Moreover, a need was expressed for twice as many gunner/loaders as drivers. The least needed additional crewmen, according to the respondents, were tank commanders.

#### Effects of Turbulence on Unit Performance

While personnel turbulence (changing personnel from one crew to another, keeping the same duty position) was reported in USAREUR to degrade both training and maintenance, position turbulence (changing personnel from one duty position to another within the same crew) was reported to have no effect on maintenance. On the other hand, the respondents showed disagreement concerning the effects of position turbulence on training. Platoon leaders and platoon sergeants believed that position turbulence improved training, while battalion commanders and company commanders believed that position turbulence degraded training. The improvement in training was attributed to the cross training stemming from turbulence, while the degradation in training was attributed to disruptions in continuity, crew integrity, and crew coordination. Any improvements in maintenance resulting from turbulence were also attributed to cross training, while degradation in maintenance was attributed to interference from personnel replacements and from a loss of pride in the tank.

Table 35

Preferences for Alternative Organizations  
and Respondent Comments

Alternative Organization (in order of preference)	Respondent Comments
Platoon Level Augmentation	<ul style="list-style-type: none"> <li>• NCOs available to supervise.</li> <li>• Training assets available.</li> <li>• Crewmen assigned to tanks.</li> <li>• Crewmen have pride in tanks.</li> <li>• High morale among additional crewmen.</li> </ul>
100% Fill	<ul style="list-style-type: none"> <li>• Cannot make up for daily absences.</li> <li>• Unrealistic based on past experiences.</li> <li>• Cannot be supported by system.</li> <li>• Simplest alternative.</li> </ul>
Company Level Augmentation	<ul style="list-style-type: none"> <li>• No supervisory personnel.</li> <li>• No training assets.</li> <li>• Additional crewmen not assigned directly to tanks.</li> <li>• Additional crewmen continually on details.</li> <li>• TOE for HQ Company cannot support.</li> <li>• More direct supervision than battalion level augmentation.</li> <li>• Additional crewmen not assigned to level at which they will perform.</li> <li>• Provides men for administrative details.</li> <li>• Stable personnel situation.</li> <li>• Additional crewmen lack pride.</li> </ul>
Whole Crews	<ul style="list-style-type: none"> <li>• No tanks available for training.</li> <li>• No assigned tanks.</li> <li>• Crews would be broken up.</li> <li>• No requirement for crew replacement.</li> </ul>
Battalion Level Augmentation	<ul style="list-style-type: none"> <li>• No training assets.</li> <li>• No supervisory personnel.</li> <li>• Additional crewmen not assigned directly to tanks for training and maintenance.</li> <li>• Additional crewmen continually on details.</li> <li>• No tanks for training.</li> <li>• Additional crewmen not assigned to level at which they will perform.</li> <li>• Men available for administrative details.</li> <li>• Additional crewmen lack personal pride.</li> <li>• Low morale among additional crewmen.</li> </ul>

The discrepancy in the perceived effects of position turbulence on training could be explained by the fact that platoon leaders and platoon sergeants are the ones who usually create turbulence as a means of maintaining or improving the level of performance in their platoons. They would therefore be more apt to perceive its benefits than would be battalion commanders or the company commanders. It is possible that platoon leaders and platoon sergeants, being closest to the actual training situation, are also more able to see the benefits of crew rotation stemming from position turbulence. They would therefore report that position turbulence improves training. Battalion commanders and company commanders, being further removed from the actual training situation, would be less likely to be aware of the benefits of the resulting crew rotation. They would therefore be more likely to report that position turbulence, like personnel turbulence, degrades training.

#### CONUS-USAREUR Comparisons

It was assumed in the conduct of the survey that any improvements in unit performance resulting from the assignment of the additional tank crewmen in USAREUR would also be likely to occur in CONUS if additional crewmen were assigned there. Since additional tank crewman positions were not authorized for CONUS, the assumption could not be tested. However, ratings of unit performance for training, maintenance, sustained operations, and unit readiness were obtained from nonaugmented units in CONUS as well as from augmented and nonaugmented units in USAREUR. It was believed that with unit augmentation, improvements in performance similar to those in USAREUR would be obtained in CONUS if the rated quality of performance of units in CONUS were similar to that of non-augmented units in USAREUR.

Comparisons between nonaugmented units in USAREUR and CONUS revealed that no differences existed in perceived quality of training and, during the second data collection phase, in the perceived capability to perform adequately during a 72-hour sustained operation. However, quality of maintenance, unit readiness, and, during the first data collection phase, the capability to perform adequately during a 72-hour suspended operation were perceived to be higher in nonaugmented units in USAREUR than in CONUS.

While these data suggest that the magnitude of the improvement in rated quality of training and possibly in rated capability to perform adequately during a 72-hour sustained operation obtained in USAREUR would also be obtained in CONUS with unit augmentation, differences in the personnel strength between nonaugmented units in USAREUR and those in CONUS make this an uncertain conclusion. Nonaugmented units in USAREUR were filled to 100% strength, but those in CONUS were not. While it is highly probable that the assignment of additional tank crewmen to units within CONUS would result in improvements in unit performance, the discrepancies in unit strength between USAREUR and CONUS make the magnitude of these improvements impossible to estimate.

## Validity of Ratings

The data presented in this report were ratings made by armor officers, NCOs, and tank crewmen. Like all ratings, they are subject to various sources of bias which must be taken into account when examining the results of the survey.

One potential source of bias stems from the desire to influence the results of the survey. The report of the Tank Forces Management Group referred to earlier described numerous problems stemming from a shortage of tank crewmen in armor units. The reason for increasing the number of authorized crewmen in armor units was to alleviate these problems and to facilitate the exploitation of new technological advances.

Because of the problems created by the shortage of tank crewmen, the respondents would be expected to welcome any increase in authorized personnel strength, particularly on a permanent basis. The respondents knew that the "Fifth Tank Crewman" survey was a test of the effects of unit augmentation. Aware of the study's purpose, a respondent may have felt the need to respond in a way that would make augmentation appear to be especially successful. Thus, other things being equal, respondents in augmented units might be expected to rate their units more favorably and respondents in nonaugmented units to rate their units less favorably.

Since it was not possible to obtain objective data paralleling the subjective ratings, the magnitude of any such response bias could not be determined. The possibility that such a bias did exist, however, is suggested by the fact that logistics problems were reported to be less serious in augmented units than in nonaugmented units. The presence of the additional tank crewmen in augmented units would normally suggest that logistics problems should be more serious in augmented units than in nonaugmented units. The responses made on the secondary questions and in the interviews indicate that logistics problems did exist in augmented units and that they were caused by the assignment of the additional crewmen. If, in fact, ratings of the adequacy of logistics were distorted in the augmented units, then it is likely that the ratings of the other aspects of unit performance were distorted as well.

An examination of the responses made on the secondary questions dealing with logistics shows that the respondents in both augmented and non-augmented units reported the existence of several logistics problems, such as a shortage of troop billeting and inadequate installation support. Since a greater effort was likely to be made to solve these problems in augmented battalions than in nonaugmented battalions, it would not be surprising to find that logistics were described as being more adequate overall in the augmented battalions. If so, then the significantly higher ratings obtained in augmented units do not necessarily reflect any conscious effort to bias the outcome of the survey.

Another source of bias that may have affected the results of the survey is the halo effect. This is a tendency to make similar judgments across a number of different scales based on an overall judgment instead of making independent judgments on each scale. This source of bias is most likely to have occurred in the ratings of the five alternative organizations. The respondents were asked to rate the anticipated seriousness of numerous problems that could occur under each of the five alternative organizations. The similarity of the ratings across the different scales suggests that the judgments were not independent. Thus, the most preferred alternative organizations tended to be described favorably regardless of the scale item, while the least preferred organizations tended to be described unfavorably regardless of the scale item.

Finally, there may have been a tendency by respondents in all types of battalions to describe their unit favorably. Many of the items in both the questionnaires and interviews were highly evaluative in nature. Not only would most respondents probably feel that they were doing a good job, many would probably want to exaggerate the rated quality of their unit in case the ratings were to reflect on their own adequacy. While the respondents were all informed that the purpose of the survey was to test the "Fifth Tank Crewman" concept and not to evaluate their performance, there was no assurance that the respondents actually believed that they were not being evaluated. However, this source of distortion is not likely to have an important effect on the results of the survey since it is likely to have been equally prevalent in both augmented and nonaugmented units.

#### Decrease in Personnel Strength

The design of the "Fifth Tank Crewman" survey specified that unit performance was to be measured at two different periods of time. This would allow the benefits of unit augmentation to manifest themselves in case the effects were not immediate. Units in USAREUR were to be filled to their assigned strength prior to the survey, and they were to be maintained at that level of strength until the end of the survey.

It can be noted in Table 2 that 36 assistant crewmen (a sample of one per company) participated in the survey during the first data collection phase, but only 24 participated during the second data collection phase. This decrease in the number of assistant crewmen was the result of a decrease in the assigned strength of the units over the two data collection phases. Although the units may have been filled to the specified level at the start of the survey, not all units were maintained at that level of strength during the entire survey period. Thus, some of the respondents in the augmented units reported during the second data collection phase that their units were in fact nonaugmented.

As the personnel strength dissipated in augmented units, the benefits of augmentation can also be assumed to have dissipated. Thus, any differences in the ratings of quality of performance between augmented and nonaugmented battalions may have been attenuated.

## Conclusion

While the described sources of bias may have affected the responses made on the rating scales, and while the loss of personnel during the survey may have weakened the potential benefits of augmentation, each of these two sources of influence may have canceled the effects of the other. That is, even if response biases may have tended to exaggerate any differences between augmented and nonaugmented units, the loss of some of the additional tank crewmen during the course of the study would have tended to cause the differences to be decreased. Thus, while the magnitude of the differences between augmented and nonaugmented battalions may not be precise estimates of the effects of augmentation, they apparently do indicate the overall nature of the effects. Moreover, it should not be concluded that all respondents in augmented battalions exaggerated their responses. Many of the officers, NCOs, and enlisted men took advantage of the survey to express dissatisfactions with their units. Finally, it should be noted that the design of the study was selected primarily because it minimized the effects of response bias. Instead of asking respondents to judge the effects of augmentation on their units, they were asked to describe the level of performance within their unit. The effects of augmentation were assessed by comparing the judgments from augmented units with those from nonaugmented units. Since respondents in one type of battalion would not know how respondents replied in the other type of battalion, deliberate distortion of the results of the survey would have been difficult.

On balance, the outcome of the "Fifth Tank Crewman" survey indicated that the assignment of additional tank crewmen to armor units resulted in numerous improvements in reported unit performance and that few problems were reported as a result of augmentation.

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